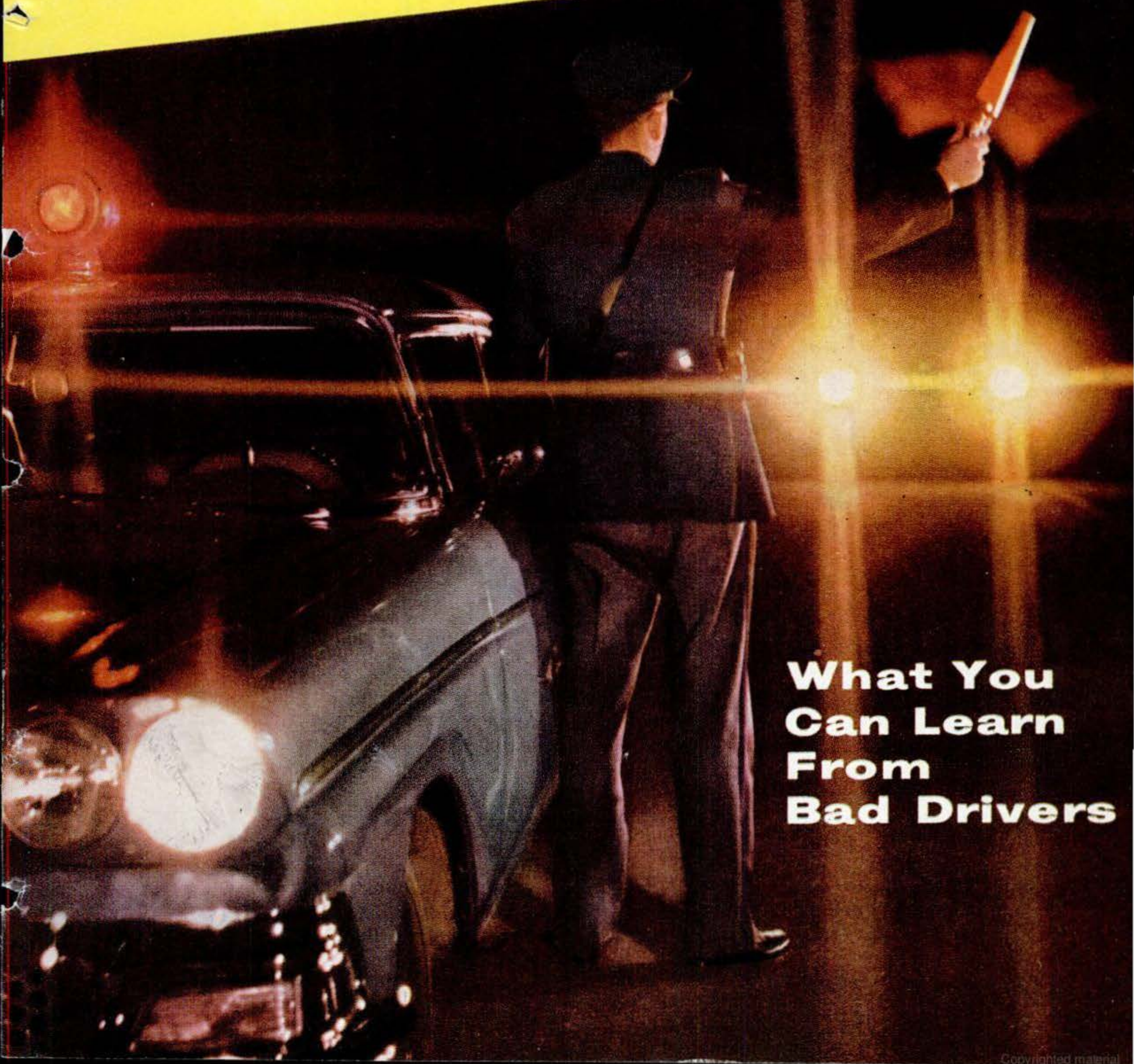
POPULAR SCIENCE

JUNE • 35c *Monthly*

Smart Shopper's Guide:

Portable Air Conditioners

What they can—and can't—do for you. PAGE 118



What You Can Learn From Bad Drivers

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"I did a clean-and-wax job in 55 minutes

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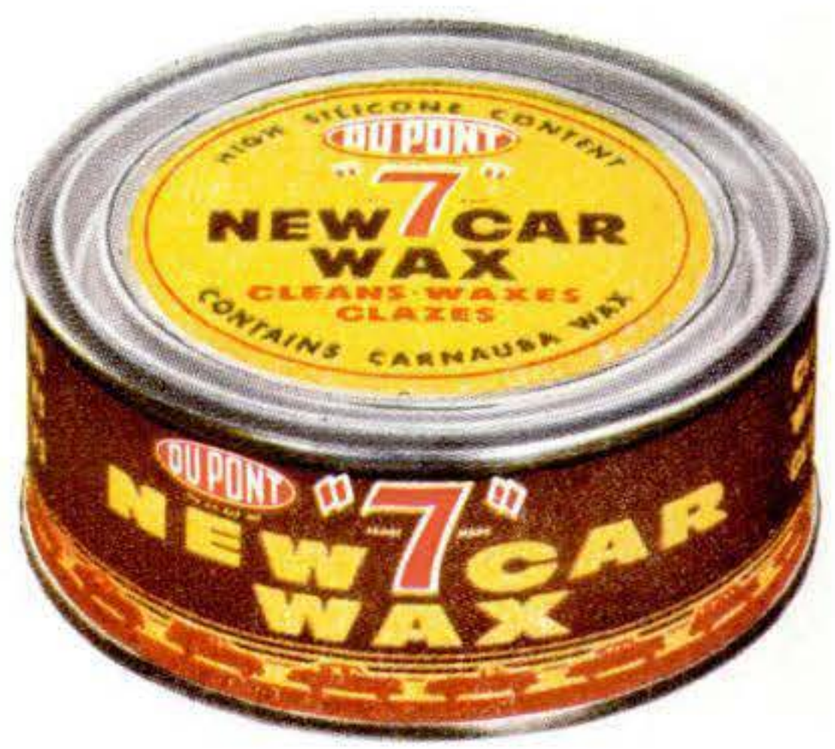
...6 months later it's still mirror-bright"

says George T. Duffin of Los Altos, Calif., after waxing his '57 Chevrolet with Du Pont New Car Wax. George found that this new paste wax is as easy to use as a liquid polish, because it cleans, waxes and glazes—all in *one easy application*. And it protects with real Carnauba wax, *the toughest wax known*. Proof of protection is the long-lasting gleam. Six months, 11 car washings later, the finish still shows clear reflections of George and his wife! Try Du Pont New Car Wax—it makes any good finish look new. At service stations and auto supply stores. Only $2.00.



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BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

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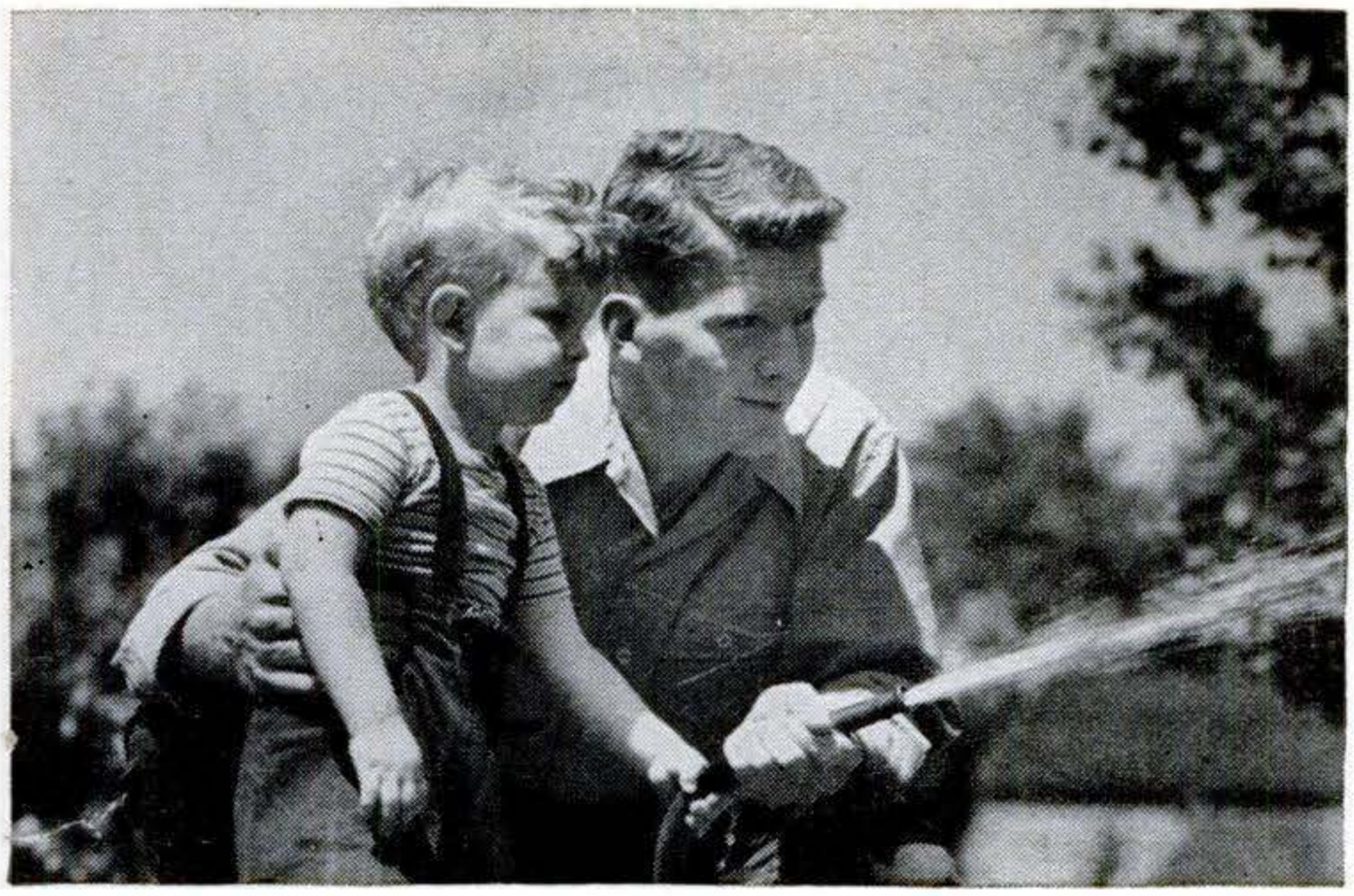

This man is a "security risk"!

Age, 29. Married. Two children. High school education. Active in local lodge, church, veterans' organization. Employed by large manufacturing concern. Earns $82 a week.

SOUNDS like an Average Joe. And he is. Too average! He's got a job. It pays fairly well. He's satisfied.

But here's the catch. With the right kind of training, this young man could be stepping into better jobs. He could be making $7-8000 a year. He could be cashing in on those spare-time hours he now wastes.

As it stands now, he's stuck in his job. Can't seem to make any headway. He's reluctant to try. So he just hangs on.

This man is a "Security Risk" to his wife and children.

His family probably will never enjoy the comforts, the prestige, the good living that could be theirs. If hard times come, they are almost sure to be hurt. For an Average Joe can't expect to compete with trained men when the chips are down.

A man like this would do well to start a planned program of self-improvement. In his spare time. In a field related to his interests and abilities. Right NOW!

One good way to start—a way proved by hundreds of thousands of once-Average Joes who are making good today—is to enroll for special training with a recognized correspondence school. One like I. C. S., the oldest and largest in the world.

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- ☐ Electrical Drafting
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- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Metallurgy
- ☐ Industrial Safety
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mech)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design ☐ Tool Making

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- ☐ Industrial Electronics
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- ☐ Radio-TV Servicing

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June, 1958

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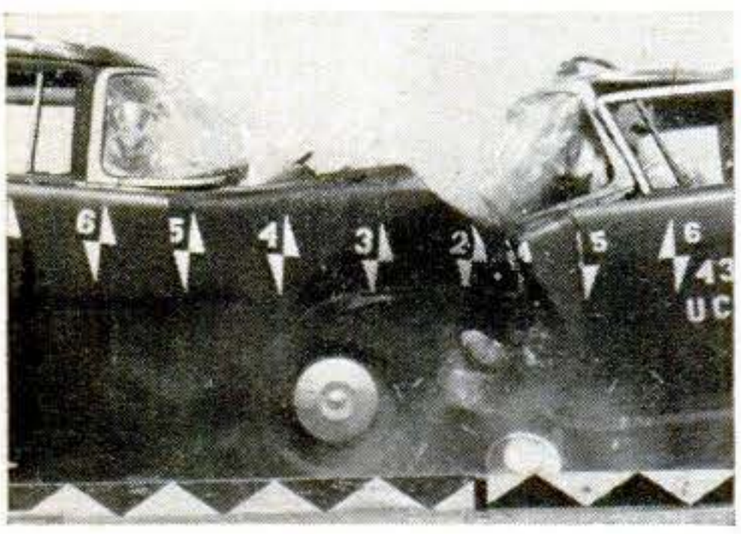

Scientists crash cars head-on to give you, for the first time, the shocking truth about car safety.

This eye in space may help weather men put out the most accurate forecasts ever made.

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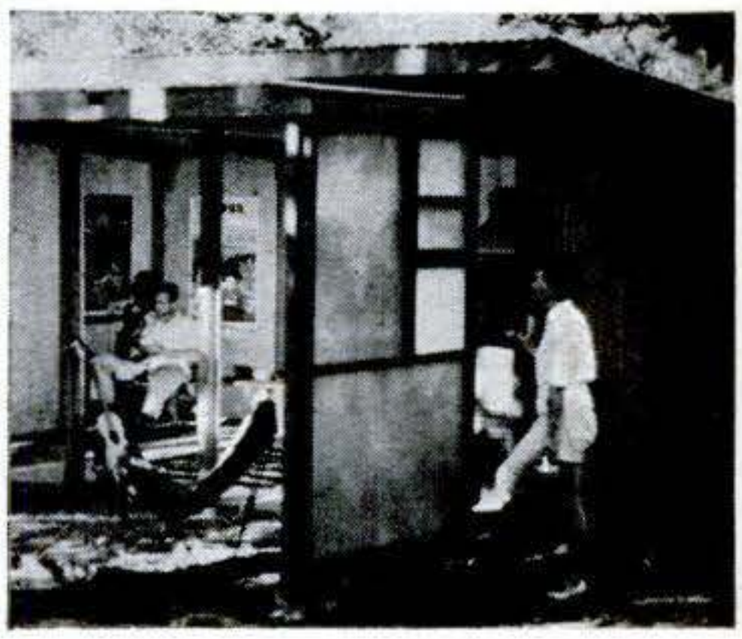

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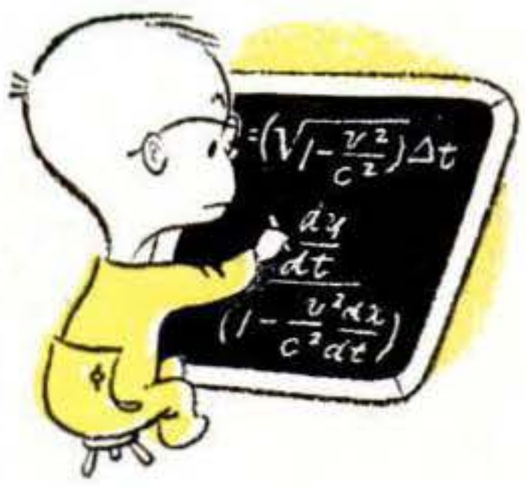
PS Readers

TALK BACK

The Admiral on Schools

THANKS for the splendid article by Adm. Rickover in March ["Russian Schools Can Teach Us a Lesson"]. The fundamental fault in our system is a heritage from the British—too much preoccupation with spelling and grammar. We are wasting up to five years of our youths' education, sacrificing this time to a wheelbarrow tradition in a space age. Maybe Sputnik has been a blessing—stimulating our thinking and forcing us to take stock of ourselves.



A. KLAUS, Varsity View, Manitoba.

. . . I'm getting a little tired of articles like Adm. Rickover's. I'd like to ask one question: What would have been written if we had launched the first satellite?

The admiral, because of his struggle for the atomic sub, should know better than anyone else that politics is a far greater deterrent to our scientific advancement than our lack of scientific education for the masses.

JOHN MUNS, San Diego.

Popular Science Wins National Safety Award for Eighth Year in Row

NATIONAL SAFETY COUNCIL

425 NO. MICHIGAN AVE.
CHICAGO 11, ILLINOIS

Mr. Howard Allaway
Editor
Popular Science Monthly
353 Fourth Avenue
New York 10, New York

Dear Mr. Allaway:

Congratulations!

It is a real pleasure for me to inform you that your organization has been voted the National Safety Council's Public Interest Award for 1957.

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Many thanks for your splendid support.

Sincerely,

Ned H. Dearborn

Ned H. Dearborn
President

KP Airman Gets the Bird

THAT Air Force Joe who says you can't work at or learn a trade in service is wrong. I find it different, particularly if you have a trade before you enter. My son enlisted and made tech sergeant, repairing bombers. He had 17 men under him and traveled all over. He also is an expert mechanic on cars and trucks, taught by the Air Force.

OLAF C. HANSEN
Carlsbad, Cal.

. . . There may be airmen that pull KP and guard duty for four years, but there is a reason. Shortly after a man enters the Air Force, he is given a battery of tests, scored on a 1 to 9 basis. The man that gets 7 to 9 scores can just about pick

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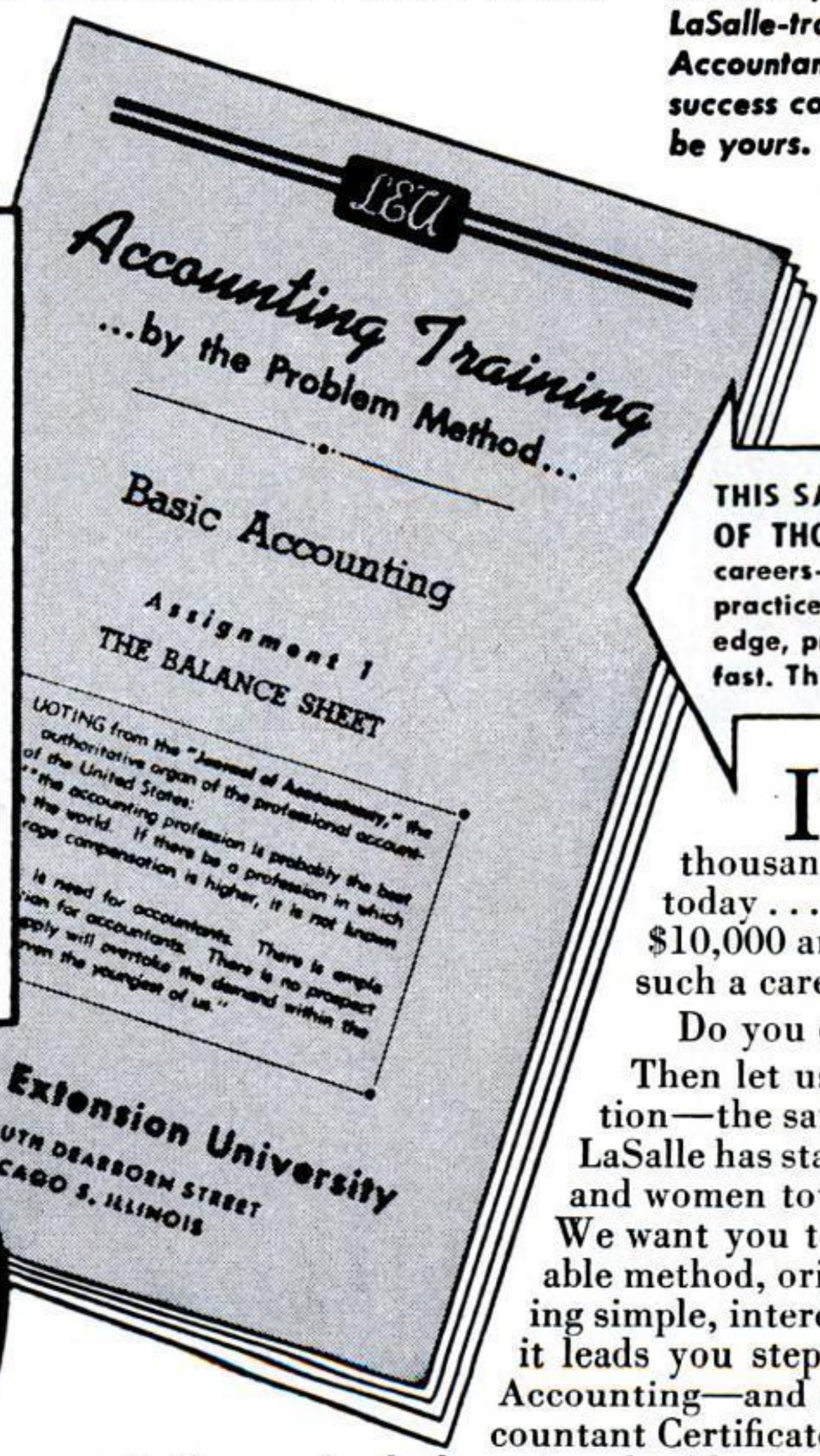

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PROFESSIONAL AIRMAN.

. . . We of Barracks 19 (Nürnberg), Association of Regular Army Sergeants, were extremely gratified to read your excellent story "Can Your Youngster Learn a Trade in Military Service?" [Jan.].

I am certain that this article helped put the minds of many parents at ease regarding the education of their sons of draft age. Most parents are not aware of the fact that the armed forces offer opportunities for the serviceman to continue his education.

LEONARD P. OWENS, PRES.
Barracks 19, A.R.A.S.

Foreign Cars: Two Views

JUST finished reading "Driving GM's German-Built Opel" [Mar.] and it is my opinion that with over five million men unemployed in this country, we should keep all the European-built cars in Europe. What's wrong with American cars?

J. F. HORNER, Steubenville, Ohio.

. . . I'm not sure I understand what you mean when you speak of the "boxlike ap-

pearance of the average import . . ." If you think that cars like the Volkswagen, Renault, Volvo, Saab, Simca, Morris, are boxlike, I'd like to know what you think the Mercury, Lincoln, Edsel and Pontiac are. The popular opinion is that the Volkswagen looks like a beetle—and I agree. But it looks much better than anything

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Learn Radio-Television

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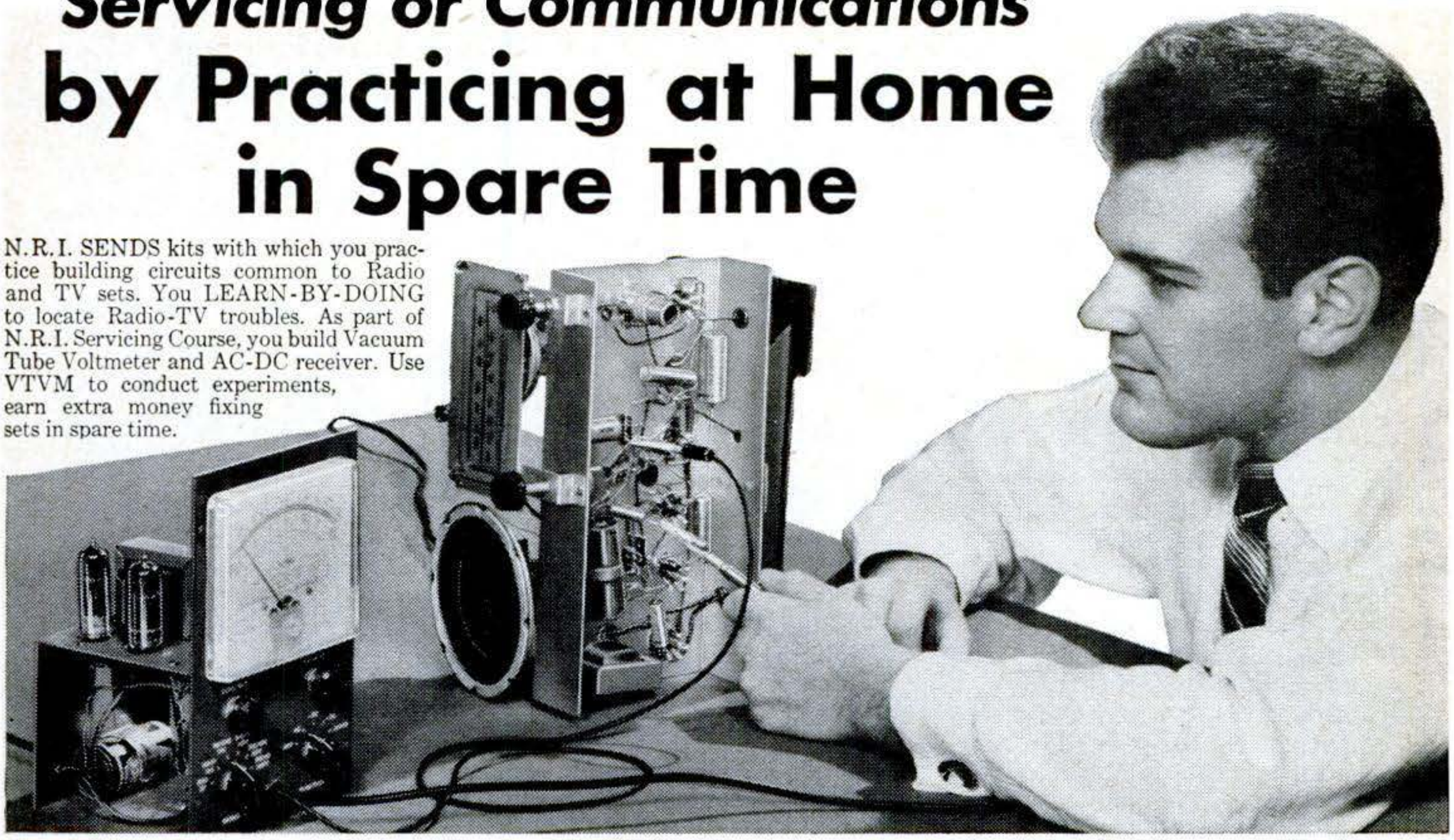
by Practicing at Home in Spare Time

N.R.I. SENDS kits with which you practice building circuits common to Radio and TV sets. You LEARN-BY-DOING to locate Radio-TV troubles. As part of N.R.I. Servicing Course, you build Vacuum Tube Voltmeter and AC-DC receiver. Use VTVM to conduct experiments, earn extra money fixing sets in spare time.



RADIO-TV BROADCASTING (see above) offers important positions as Operators and Technicians. RADIO-TV SERVICING Technicians (see below) needed in every community. Their services are respected, their skill appreciated.

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J. E. SMITH
Founder

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N.R.I. TRAINED THESE MEN FOR SUCCESS

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"Doing spare time repairs on Radio and TV. Soon servicing full time." CLYDE HIGGINS, Waltham, Mass.

"I had a successful Radio repair shop. Now I'm Engineer for WHPE." V.W.WORKMAN, High Point, N.C.

"There are a number of NRI graduates here. I can thank NRI for this job." JACK WAGNER, Lexington, N. C.

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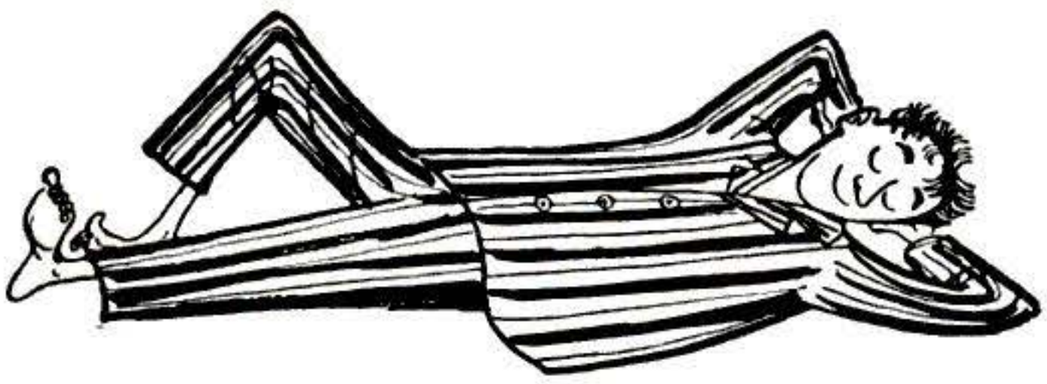

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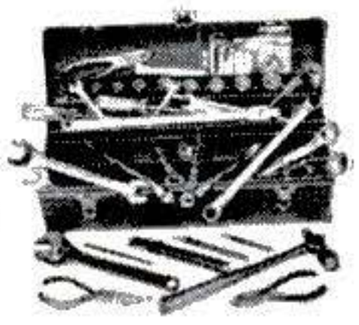

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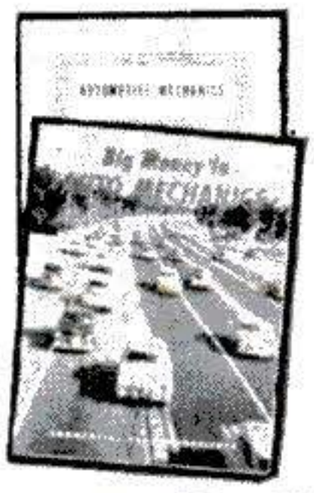

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produced here. Of course the "pretty" Opel is a GM car, but it's still foreign-made. I'm always goaded to come to the rescue of the foreign car when anyone calls it a shoebox on wheels.

CARY BEHLE, Tulsa.

Warning on Window-Shade Repair

WE HAVE just seen your Fix-It-File article on window shades [Mar.]. We have been manufacturing window-shade rollers for over 100 years, and we highly disagree with the suggestion on lubricating the pawls of a roller. At no time should any lubricant be put on this pawl or it will stick and not drop. We are very careful during manufacture of rollers to keep this part dry and free of any foreign substance.

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Would Flap Ears Help?

"THE Wonderful Way We Hear" [Jan.] says "those flaps that decorate the sides of your head aren't really important." Aren't you overlooking something?

Why do people cup the ear when sounds

barely audible happen to interest them? Basically, their hand directs sound waves toward the outer ear. High frequencies are directional and nature gave the animals the ability to alter the position of their "flaps." Cup your ears and you'll quickly recognize an increase in decibels of frequencies above 1,000 cycles.

A. J. DUARTE, Hilo, Hawaii.

When you cup your hand over the ear, you direct sound waves toward the inner *ear because "those flaps that decorate the sides of your head" won't do the job for you.*

Artist Gets Spring Fever

AS A great admirer of the Model Garage and Gus, I especially enjoyed the humor in the April story. But how come the tale is all about a 1957 Ford and the illustration plainly shows a 1958 Ford?

D. MCCONNELL, Racine.

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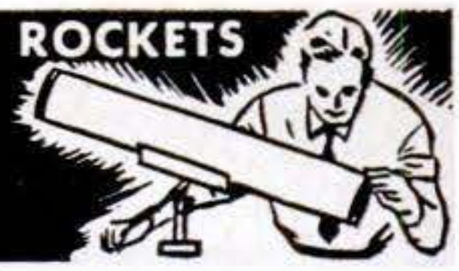

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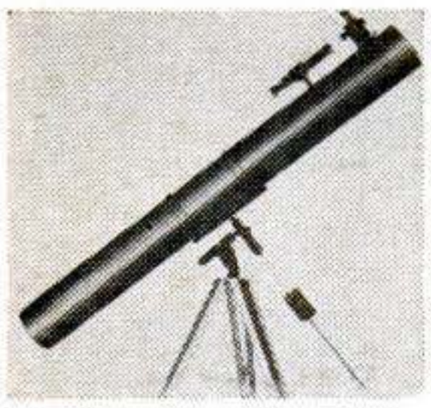

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The month in science

Ship without a crew. Now on the drafting boards at Britain's Mitchell Engineering Co. is a ship that picks up where Jules Verne left off. It will run on atomic power, but that's only the beginning.

- Type—submarine. It will look like an airplane fuselage, with cabin on top and propeller in front.
- Purpose—carry oil, 80,000 to 100,000 tons' worth, which puts it in the class of the biggest tankers yet built or planned. It will load and unload underwater.
- Speed—a top of 58 m.p.h. underwater.
- Crew—five men ordinarily, but electronic apparatus could guide it across the ocean with nobody at all on board.

Only slightly less fantastic are atomic merchant ships already under construction. With their small but astonishingly long-lasting supplies of uranium fuel, they can float big cargoes vast distances—more than 10 times around the world—more economically than oil- or coal-fired ships can.

First in the water is Russia's Lenin, an icebreaker that may carry passengers and cargo on the Archangel-Vladivostok route. Lenin's atomic engine is a hefty brute: around two-thirds the size of our big electric-power reactor near Pittsburgh. It will deliver 44,000 hp. for a speed of 18 knots, running a year without fresh fuel.

The first U. S. atomic merchantman is now taking shape in a Camden, N. J., shipyard. The Savannah will be a sleek 588-footer carrying 9,340 tons of cargo and 60 or more passengers at 21 knots. *Her* atomic engine—a time-tested ultra-reliable pressurized-water reactor—will deliver "only" 22,000 hp., but can run 3½ years or about 350,000 miles on one fuel charge.

Safety precautions are elaborate. They include:

- A thick steel tank surrounding the reactor;
- Collision mats—to protect the reactor in an Andrea Doria accident—built up of one-inch steel and three-inch redwood;
- Three separate emergency power systems—one to provide standby electricity and power for an emergency propulsion motor, another for standby steam, and a third for emergency electricity.

Savannah is strictly a demonstration ship—built to prove the safety and reliability of atomic power. Hence the super-conservative overdesign (". . . a safer ship than any ever built," says the project chief). Hence high cost ($39,000,000) and uneconomic operation.

Future A-ships, though, will be economical. They are already in the works. Under study are four different types of atomic engines, differing basically in the way heat is extracted from the splitting uranium:

- The Pressurized-Water Reactor (an advanced version of the engine in the Savannah) heats water that does not boil itself but does convert a second separate water supply into steam.
- The Boiling-Water Reactor is what its name implies. Water boils

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inside the atomic furnace, directly furnishing steam for power.

- The Organic Moderated Reactor heats a circulating supply of liquid hydrocarbon compounds.
- The Gas-Cooled Reactor (the type the British use in the Calder Hall power plant) transfers its heat to gas blown through the furnace. The gas could be carbon dioxide or helium.

The built-for-show Savannah will be gliding the seas by 1960. Shortly after will come the built-to-make-money atomic merchantmen, plying the world's trade routes with barely a thought to fuel stops.

How to stop H-bomb tests. The hassle over prohibition of test explosions of nuclear weapons gets livelier than ever, now that the Russians have said they will stop their tests. Caltech's Nobel Prize chemist Linus Pauling charges that fallout from bomb tests will shorten the lives of a million people by 10 to 15 years. Japanese scientists claim that continued testing will bring "the danger point to the human race" by the 1980s.

Official U. S. attitude is calmer: Fallout poses a health hazard, but a tolerable one compared to the hazard of losing a war.

Could a worldwide test-ban be arranged—and enforced? The U. S. is now trying to talk Russia into an enforcement scheme that would involve inspectors spotted around the world (that means on territory of the U. S. and the USSR) to detect violations.

How would it work? You can get an idea from a thorough but strictly unofficial report on a similar idea by Columbia physicist Jay Orear.

Orear figures on 22 control stations inside the USSR, bringing every point in Russia within 300 miles of at least one. Each station would use three overlapping methods to detect blasts:

- Acoustic waves—small variations in air pressure—would give away most tests, but miss explosions deep underground or high above the atmosphere.
- Seismic waves would signal the underground shots (a small one last fall was detectable 2,000 miles away). The instruments would not be fooled by natural earthquakes (the waves are different) but might be fooled by big conventional explosions.
- Light waves would reveal tests aboveground, even at very high altitudes. Just a photocell pointed at the sky will do this, and Orear adds, "It also appears feasible to detect the flash reflected from the moon."

Orear concedes that none of these methods guarantees detection of extremely small tests (they can be as weak as a firecracker), but feels the plan is still worth while because it would:

1. Put an end to radioactive fallout.
2. Take a first step toward a wider international settlement.

Martin Mann

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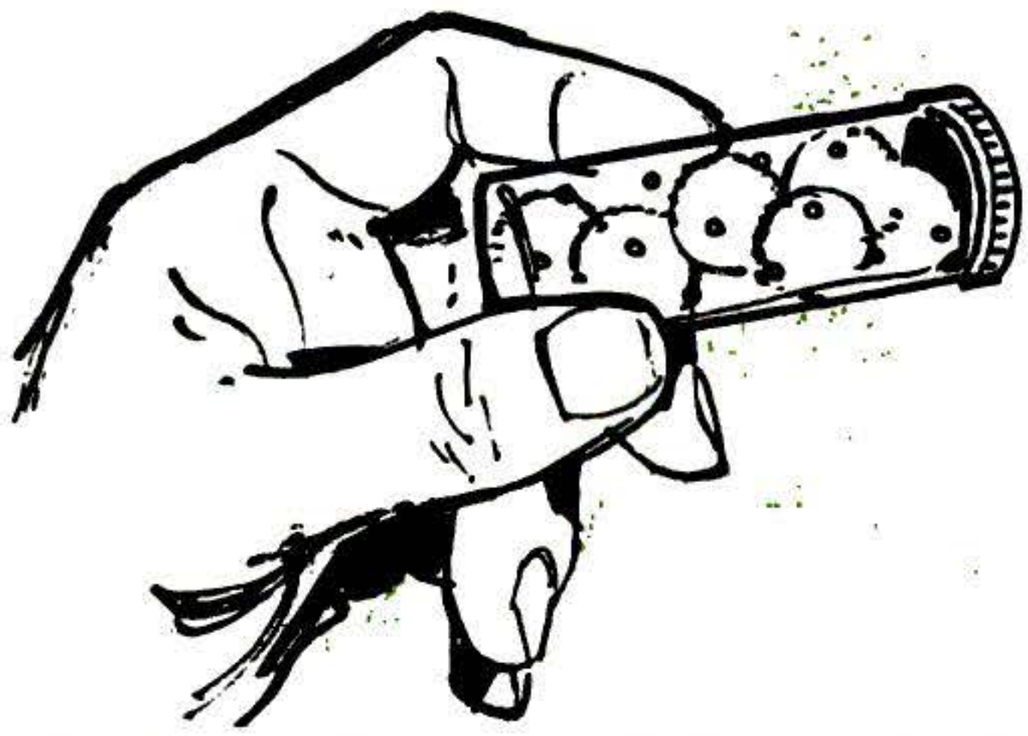
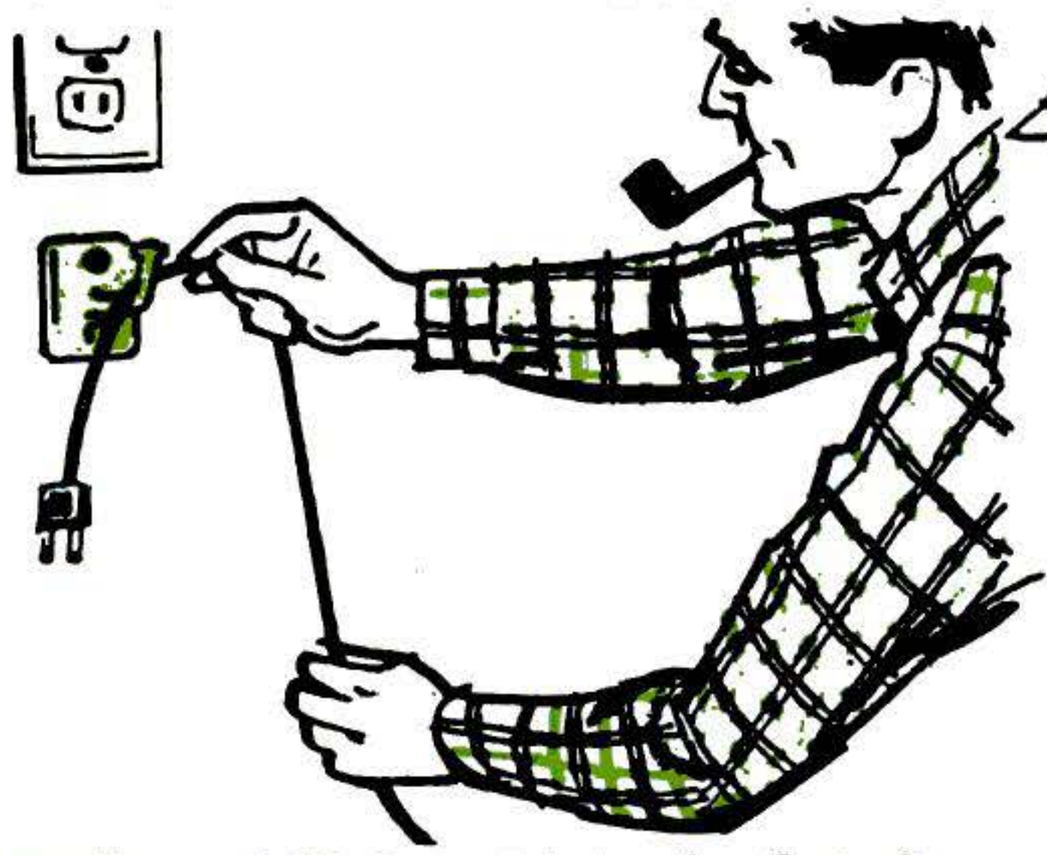
Keeping the Home Shipshape

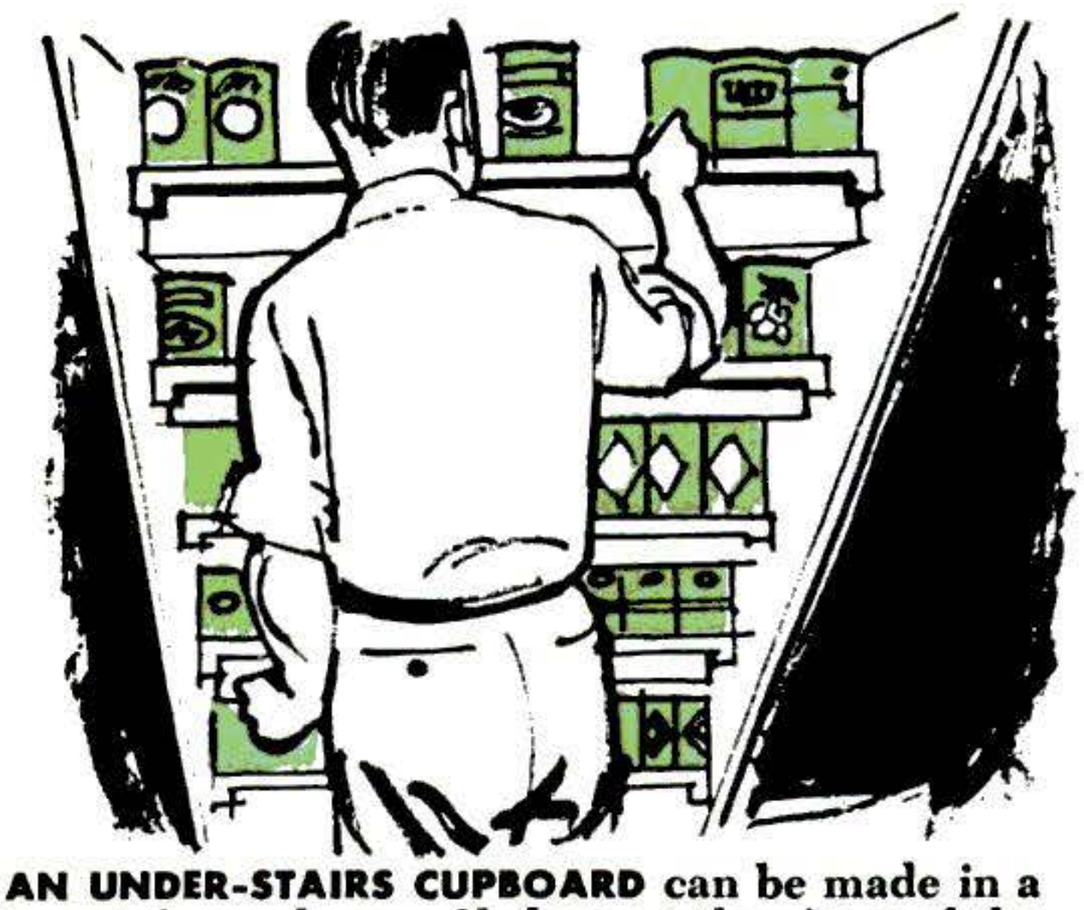


TO MAKE HOLDERS FOR MOTH REPELLENTS, drill 1/16" holes in plastic pill vials. Fill the perforated vials with flakes or nuggets and drop them into the pockets of stored clothing.



KEEP THE PLUG-IN CORD HANDY for that often-needed appliance. Hang it on a small clothes hook under the outlet. Then it won't snake to the floor, or uncoil on the counter top.

LAYING LINOLEUM ON A STAIRWAY to the basement? If the steps are worn and uneven, make sure of a smooth surface by covering them with treads cut from ¼" plywood or hardboard.



AN UNDER-STAIRS CUPBOARD can be made in a two-stairway house. Shelves on the risers of the second-floor steps will hold canned goods that you can reach from the basement stairs.

STORE PAPER BAGS in a wire bike basket hung on the inside of a closet door. They're easier to get at than if stuffed in a drawer and there's a bonus in released drawer space.

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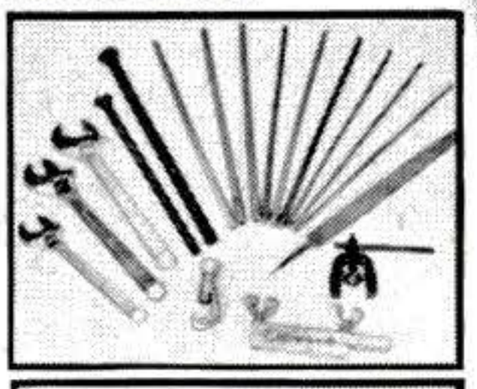
CTI training is practical, much like field calls. Most students do part-time work soon after enrolling. Some get jobs with dealers, others make calls on their own. A number sign service contracts with food stores, meat markets, motels, restaurants. With earnings, students pay tuition, buy shop equipment.



Be Independent! Open a Shop and Be the Boss

Many students make service calls, build up customer lists. Others get evening and week-end jobs. Upon graduation, a surprising number prefer to go in business for themselves. CTI training and CTI tools can give you a start. Service shops often blossom into sales rooms.

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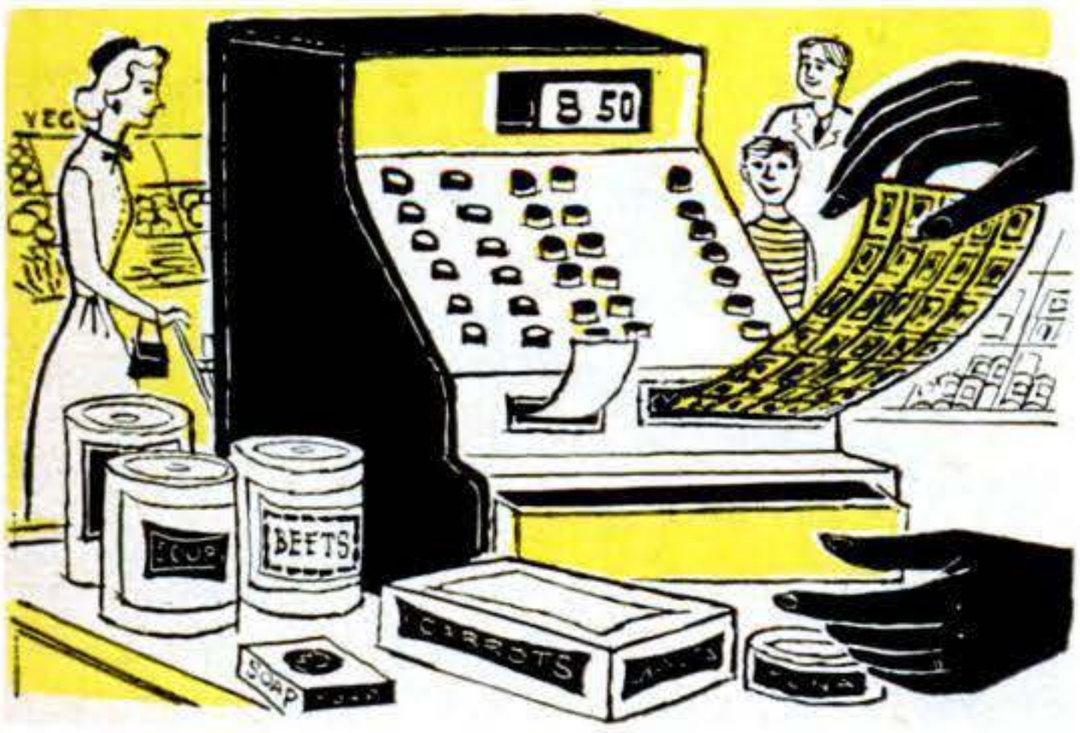
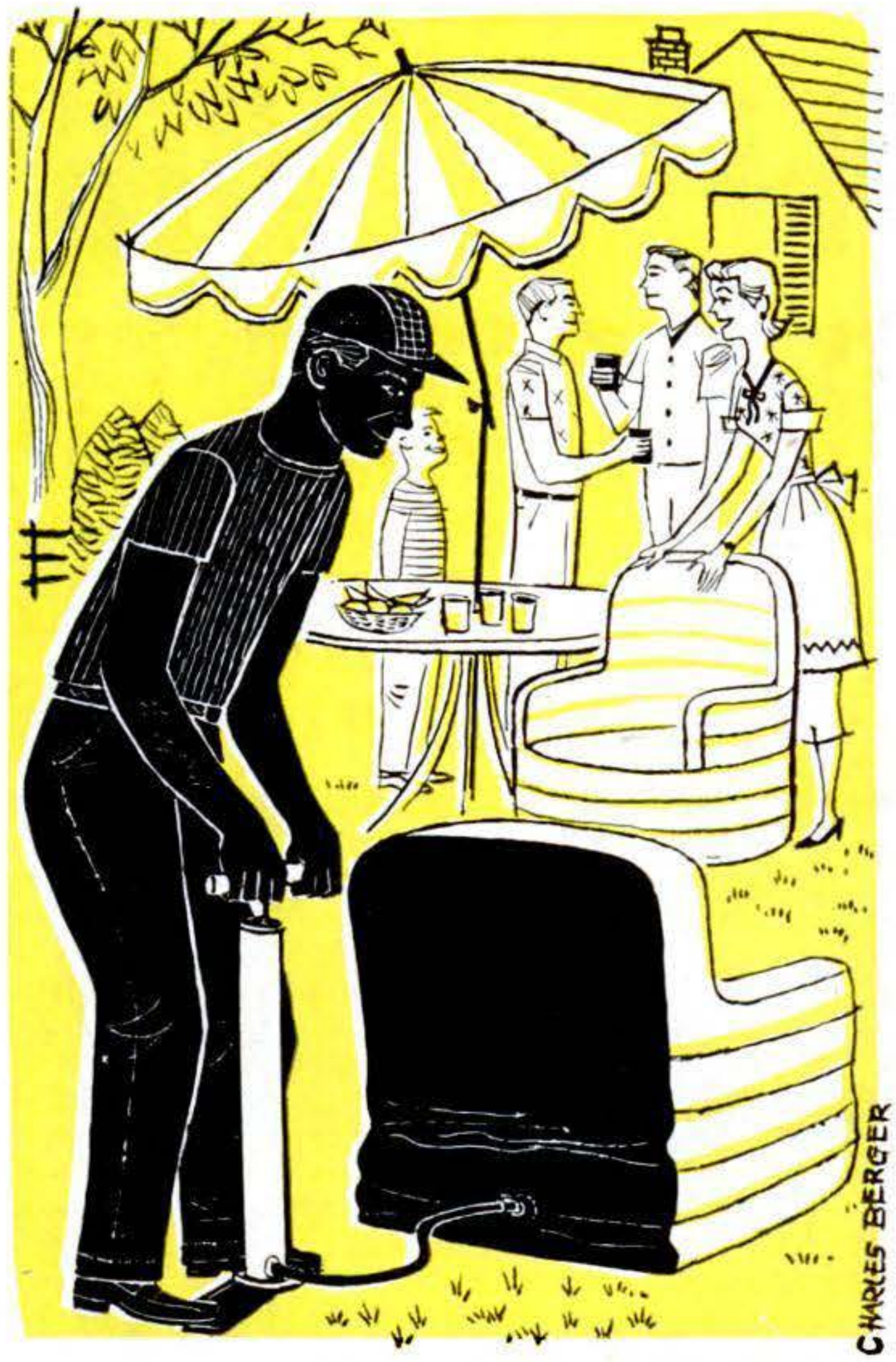
"I'd like to see them make..."



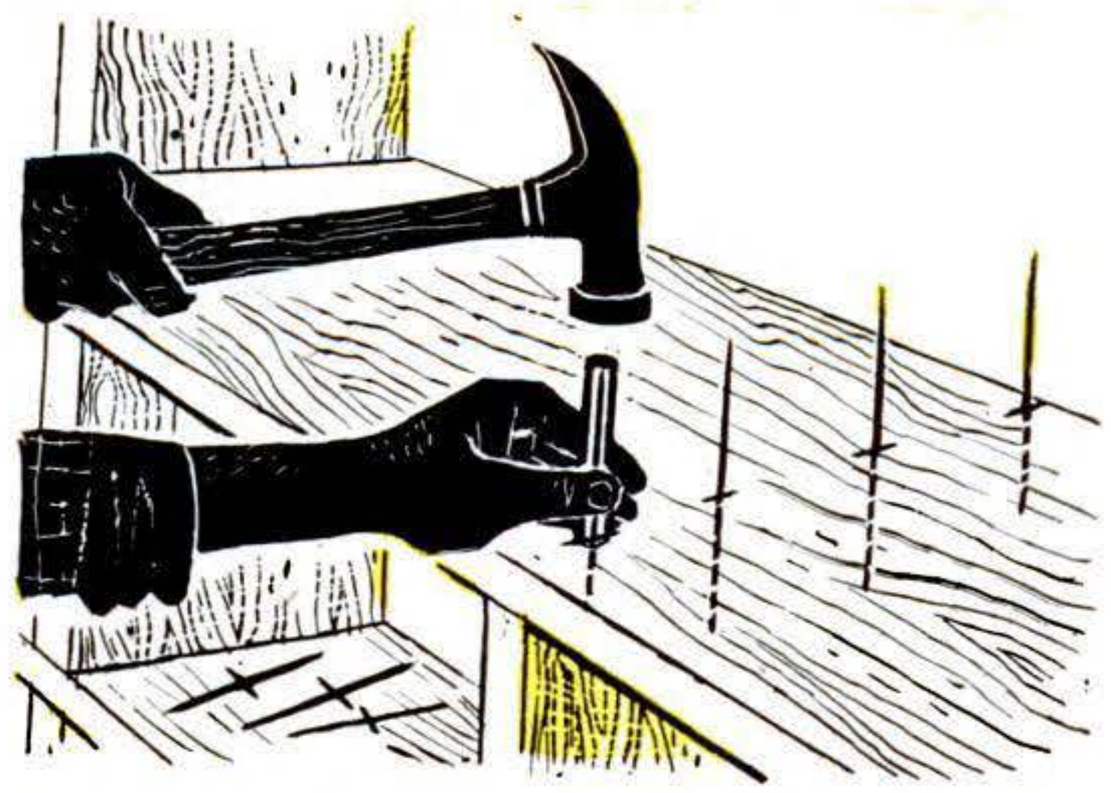
STAMP-DISPENSING CASH REGISTERS. They'd hold rolls of premium or gift stamps and release the correct number as the bill total is rung up. —*Bob Lee, Redondo Beach, Cal.*



INFLATABLE FURNITURE of heavy plastic for use outdoors—or indoors when extra seating is needed. Deflated, it would take little storage space.—*R. C. Dunne, La Grange, Ill.*

A REAR AIR DUCT IN CARS to permit air entering front ventilators to escape. This would make it unnecessary to open windows in rainy weather.—*J. C. Culler, Newberry, S. C.*

CEMENT BAGS LIKE SHOPPING BAGS, with handles and tough pasteboard bottoms to keep the unused contents of an opened bag dry and off the ground.—*Bobby Burns, Whiteville, N. C.*



TWO-ENDED NAILS for invisible joinings without drilling. Set a tube on the head to drive in one end, then drive the work onto the other end.—*J. L. Barrett, Beckley, W. Va.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

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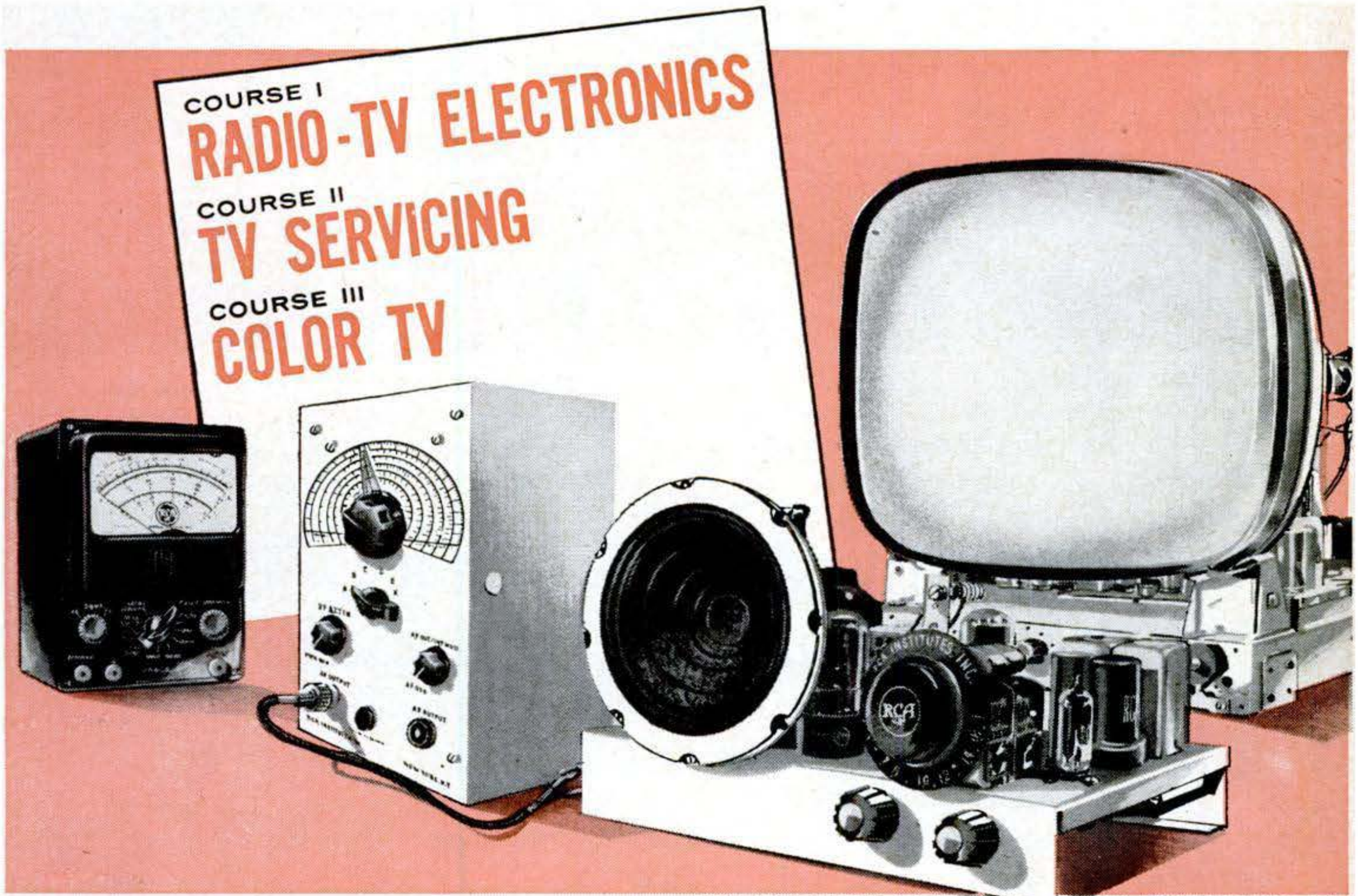

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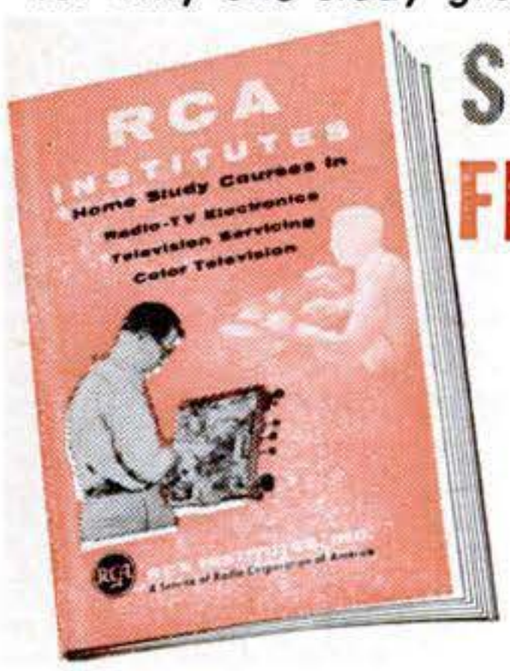

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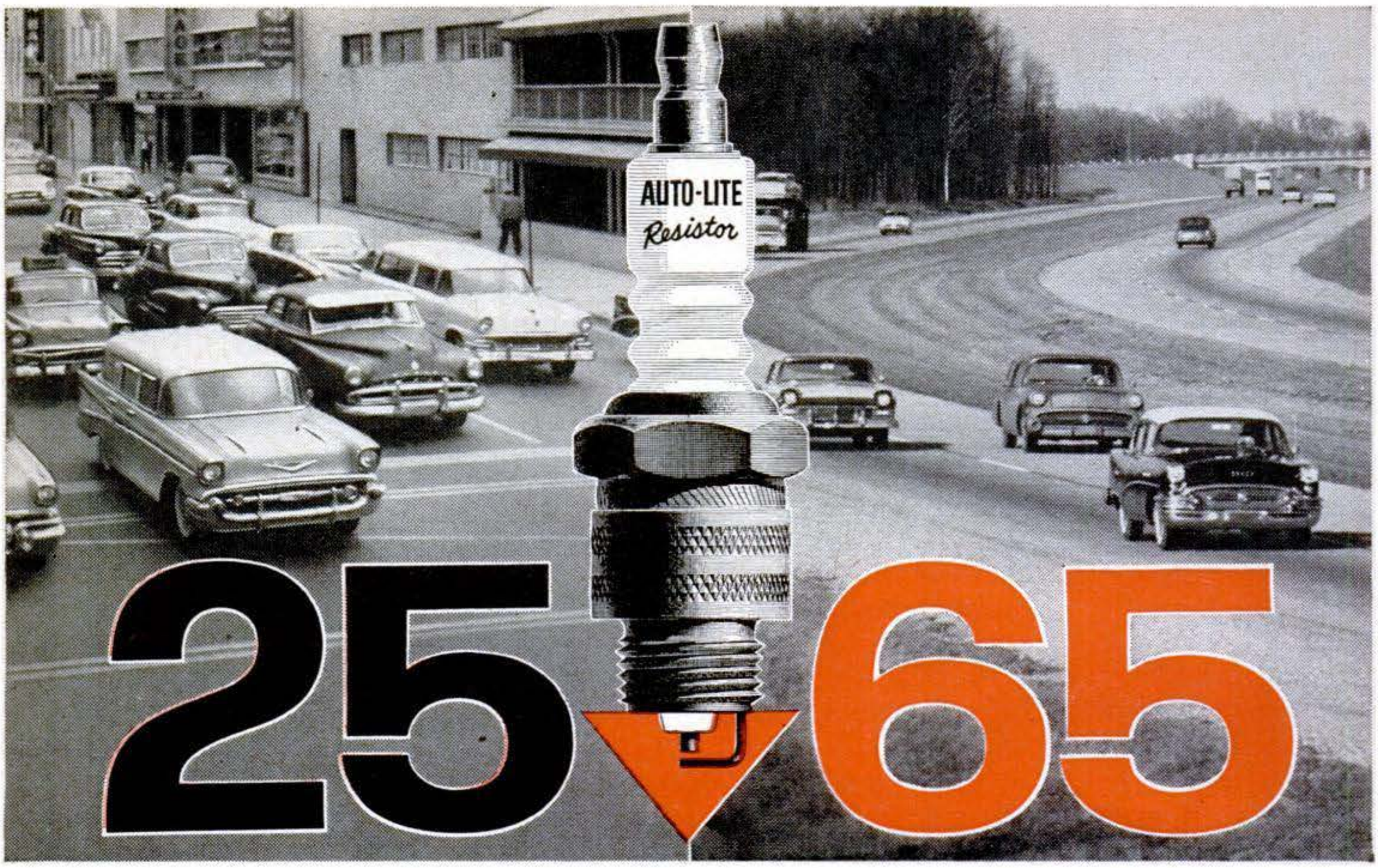

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Will Ford put its 1961 models on sale in 1960? Top brass at Ford Motor Co. have been head-scratching late into the night on this one. The decision would mean a tremendously expensive crash program. Why the speedup? A greatly different design could spur sales, might help put Ford ahead of the pack that year. Detroit insiders say the brass is making up its mind now, maybe while you read this.

If the models ride, as planned, in 1961, the Ford management has until March, 1959, before it must okay the clay mock-ups, those handmade shapes that foreshadow the new designs.

But what if Ford does decide to move these cars up a year? That puts the company's officials on the spot. The styling deadline is now. What's more, they'll have to chop 11 months off the engineering timetable for die work, tooling and assembly planning. The speedup skyrockets costs. Ford production men will have had to complete over 100 mock-ups under cost-is-no-object conditions. Each mock-up will cost roughly $175,000.

Can car air conditioning really improve your driving? One manufacturer, O. A. Sutton Corp., Wichita, Kan., set up shop in the furnace heat of an Arizona desert to find out. One car had a Vornado conditioner made by Sutton, the other had none. A doctor confirmed Sutton's conclusions: Air conditioning does help you drive better and safer in summer.

Two young athletes in the pink drove for two weeks over a 500-mile test course. In the un-air-conditioned car, the drivers experienced these symptoms:

- Depth perception: 28 percent poorer at the end of the driving day. (Conditioning *improved* it by 16 percent.)
- Self-hypnosis: The sun's glare had a sleep-inducing effect. (The cooled drivers felt none of this.)
- Temperament: The heat-blasted car left one of the drivers feeling "mean." He got an intense urge to give her the gun, and take chances.

Does an air conditioner do anything for the car itself? Sutton concluded that it cuts gas consumption, though not the way you would expect. The car without a conditioner burned four gallons more a day. Apparent reason: Open windows create drag.

Keep a wastebasket in your car this summer. Many street and highway authorities are suddenly fiercely enforcing anti-litter laws. Fines can run as high as $50. So carry a few paper or plastic bags. You can empty them when you stop for gas.

Pay for skill as well as hash marks. That's the incentive the armed forces will dangle before draftees and regulars alike. It's the strategy behind a $668,000,000 military pay-hike bill now in the works in Washington.

Here is how this lofty legislation could affect you: After June

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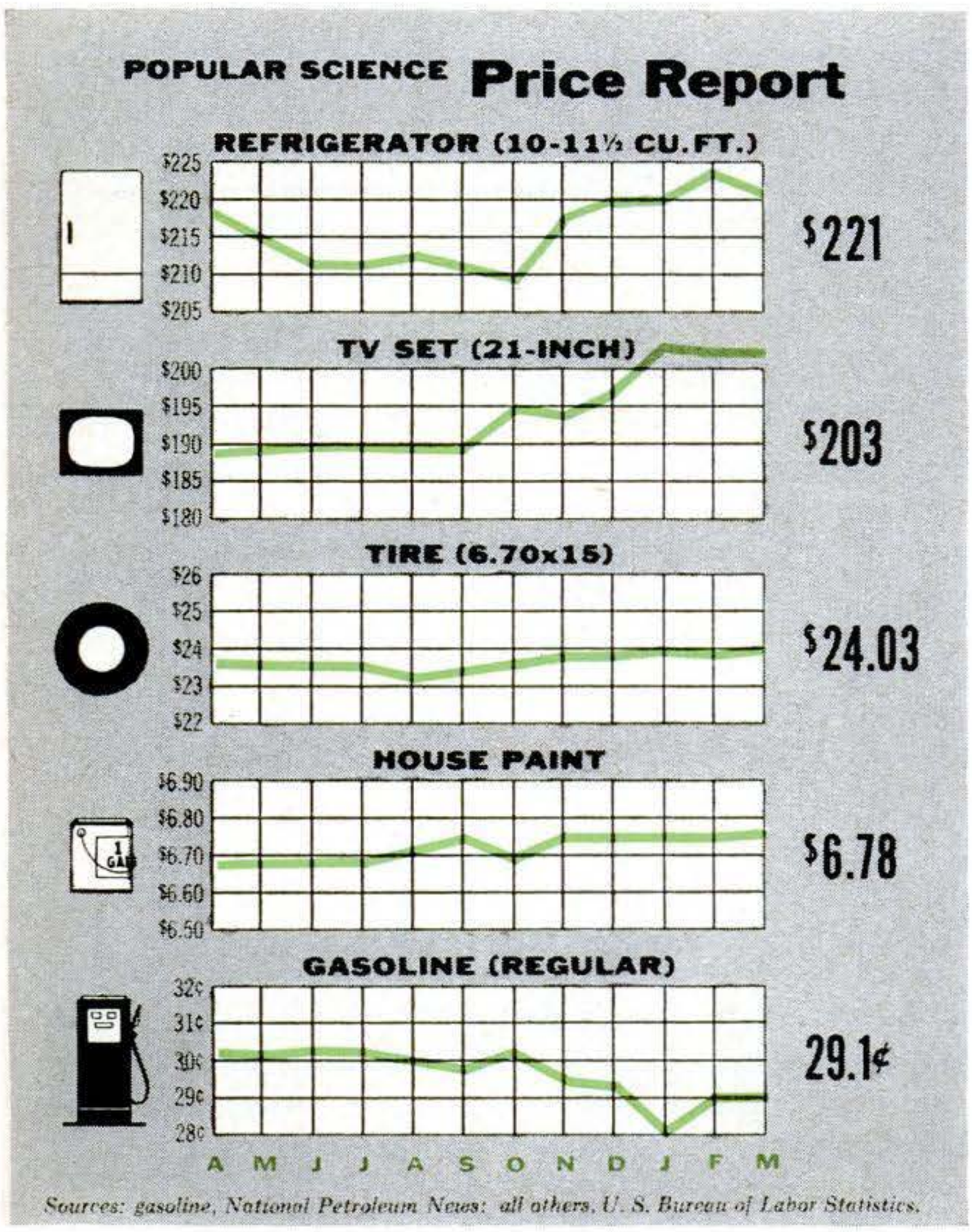
You ought to know...

graduation, the young man in your family may find military service rewarding in more ways than one. (See PS, Jan.: "Can Your Youngster Learn a Trade in Military Service?")

The Pentagon is still alarmed by the fast turnover of skilled men in the ranks. A committee headed by General Electric President Ralph Cordiner has come up with a baited proposal: extra pay for proficiency. The new bill aims to:

- Encourage enlistments among technically talented young men.
- Hold them for a career by offering preferred advancements.
- Shift servicemen skilled in the "soft" specialties (paper work, cooking or transportation) into training for "hard" fields—radar, missiles, electronics and atomic weapons.

Under this plan, a skilled man won't have to buck for a promotion to get more money. Take a staff sergeant, a top-notch jet-engine mechanic, in a squadron that's fresh out of promotions. Though he stays at staff, he can still get into the next two pay grades and make $40 to $100 more a month.



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But more promotions are already opening up, too, and favoring "hard" skills. "Soft" skilled jobs may get the leavings.

Another plan would pay what amounts to a bonus.

Whatever his grade, a serviceman can get up to $150 more a month for the "hard" skills he develops, via this alternate scheme written into the pay-hiking bill. This "proficiency-pay" plan conceivably could boost a serviceman's income to $10,000 a year if you total his proficiency pay, base pay, longevity and other allowances. The aim: proficiency hikes for 15 percent of a service arm's total strength.

Which of the two pay-raise methods will be used? It's a toss-up. The bill permits each service to choose for itself.

Charles M. Graney

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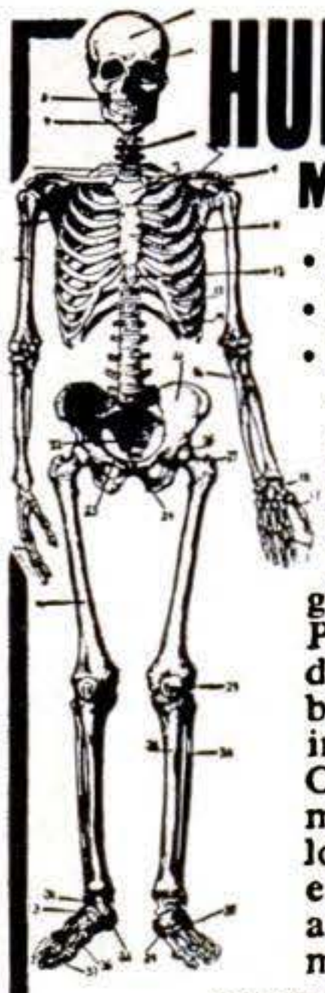

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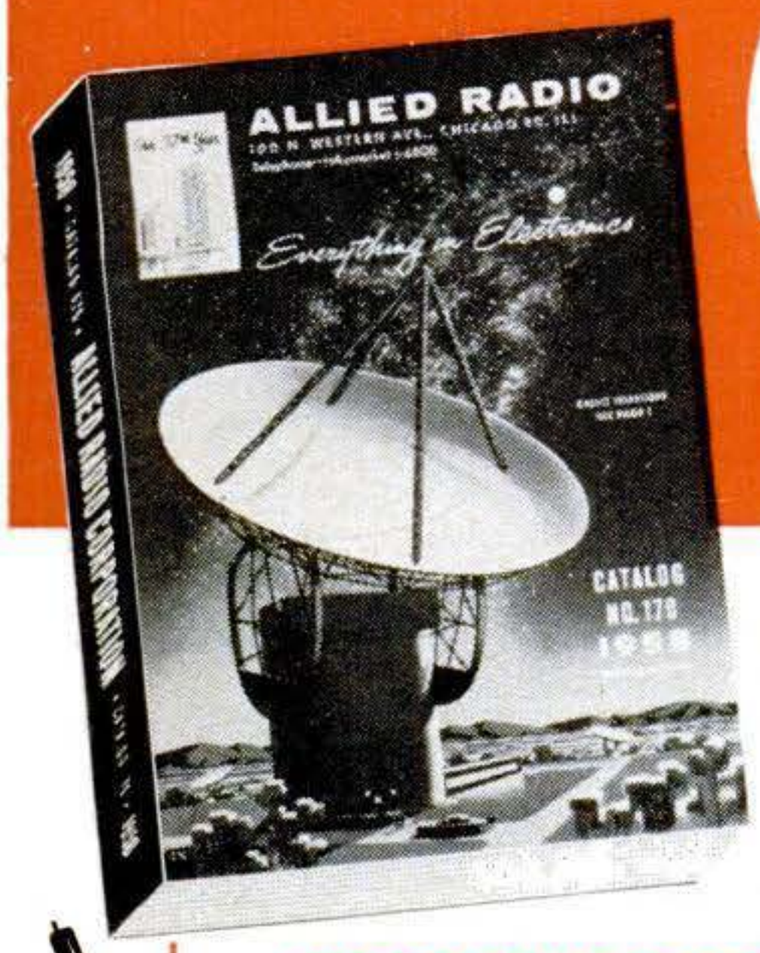

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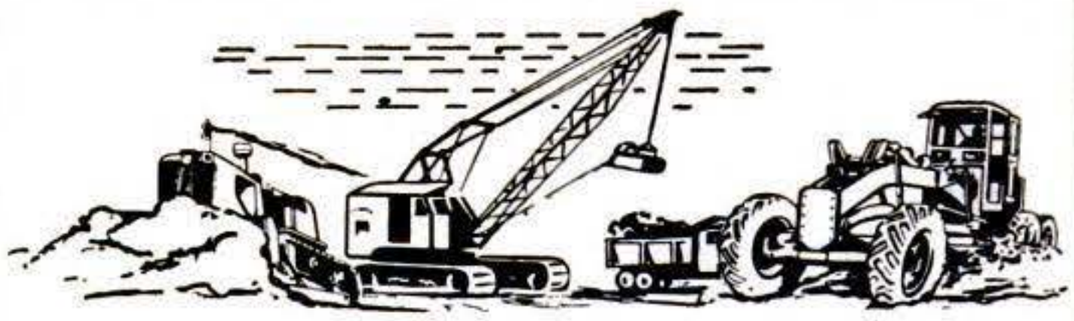

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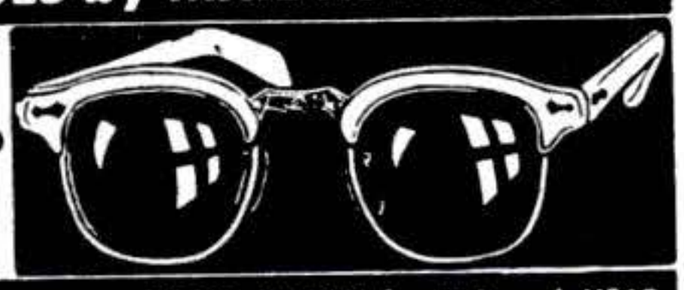

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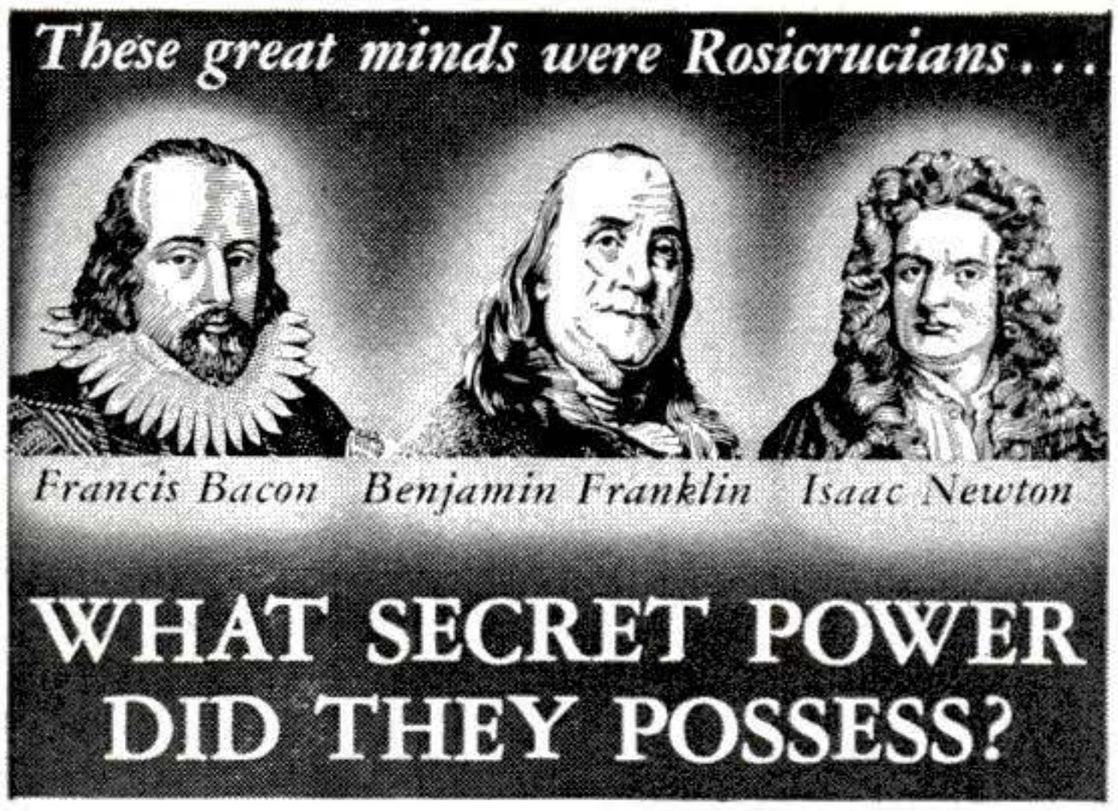

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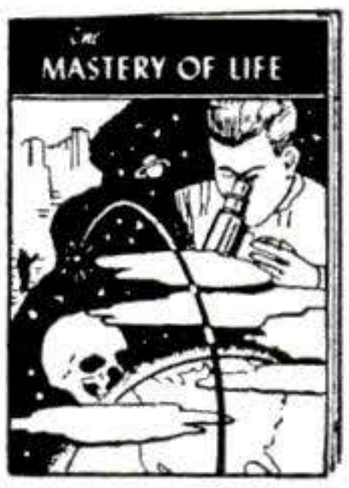

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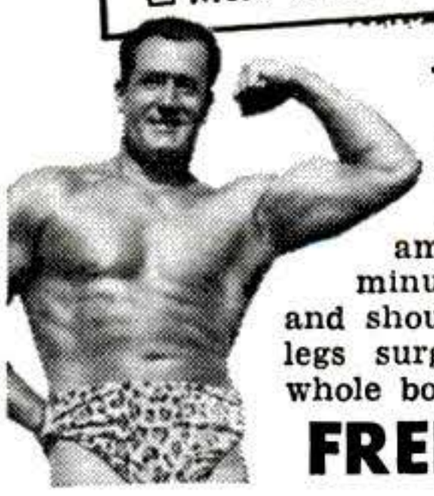

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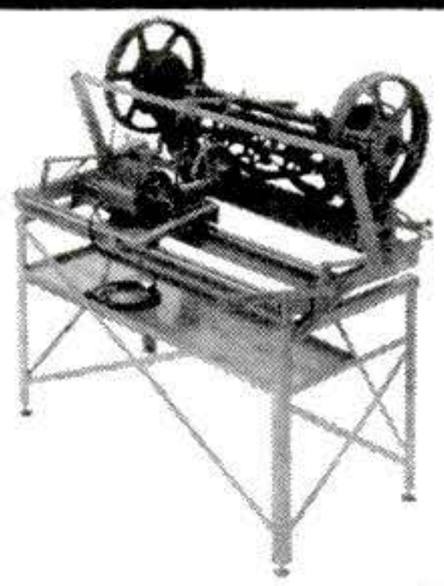

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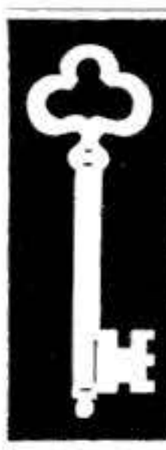

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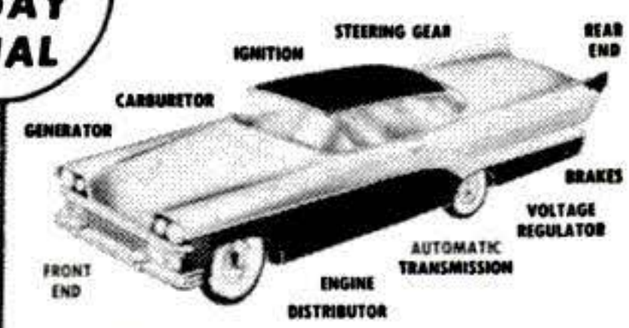

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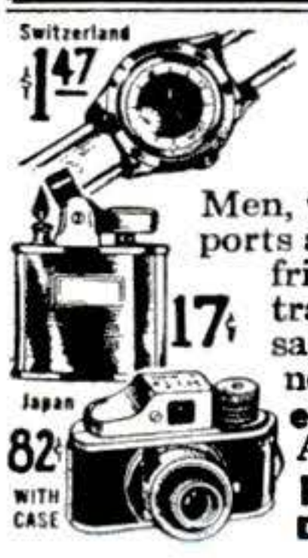

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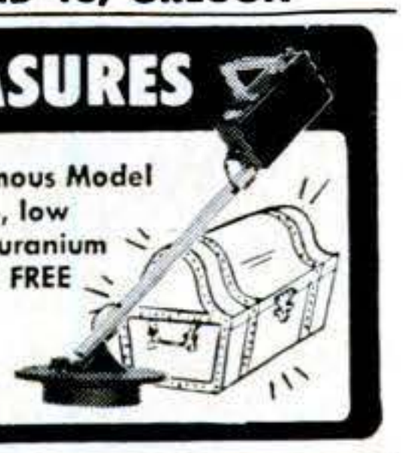

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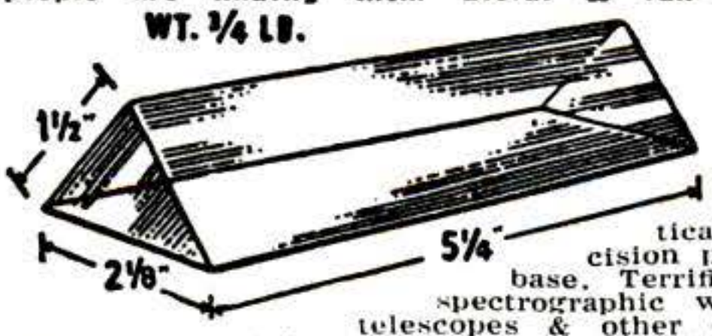

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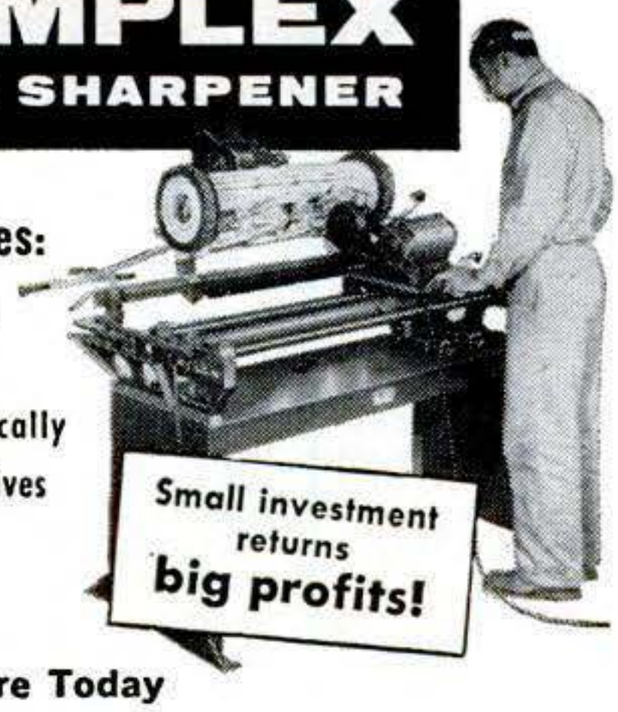

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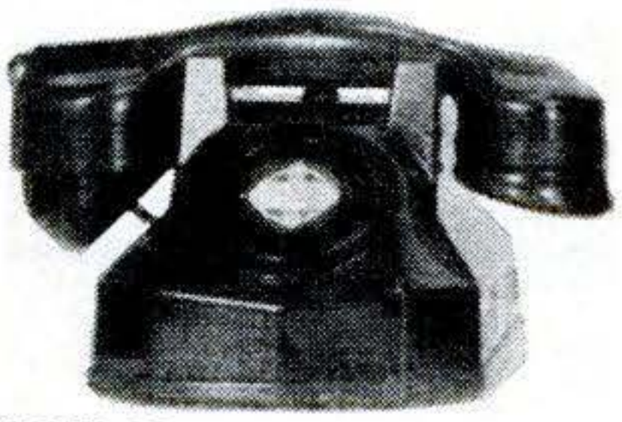

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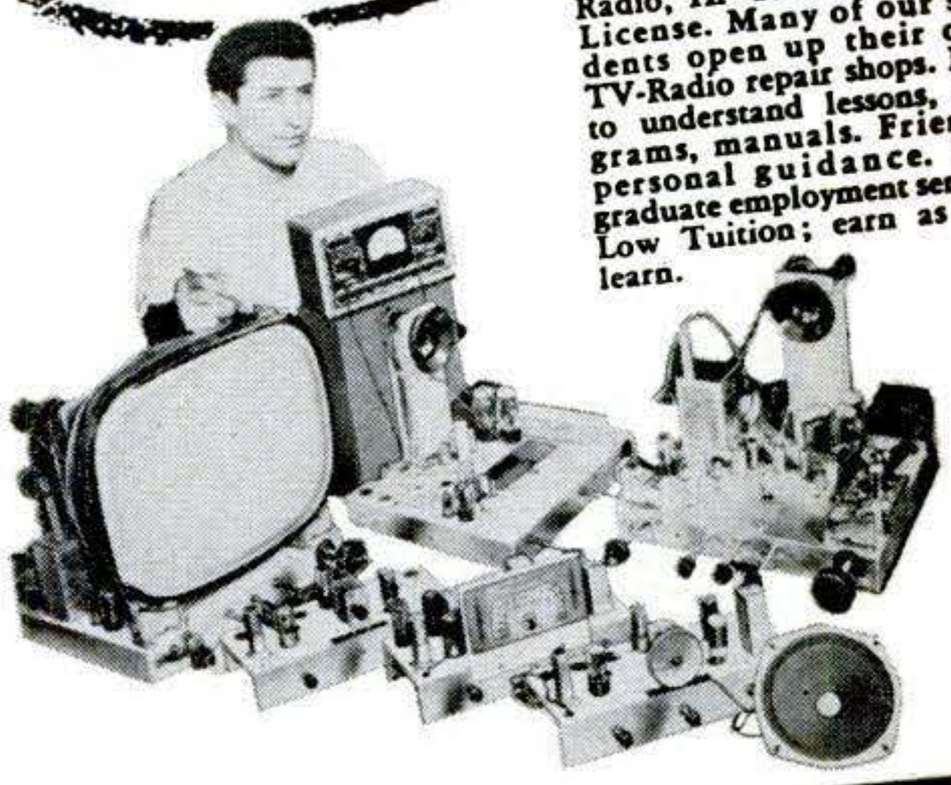

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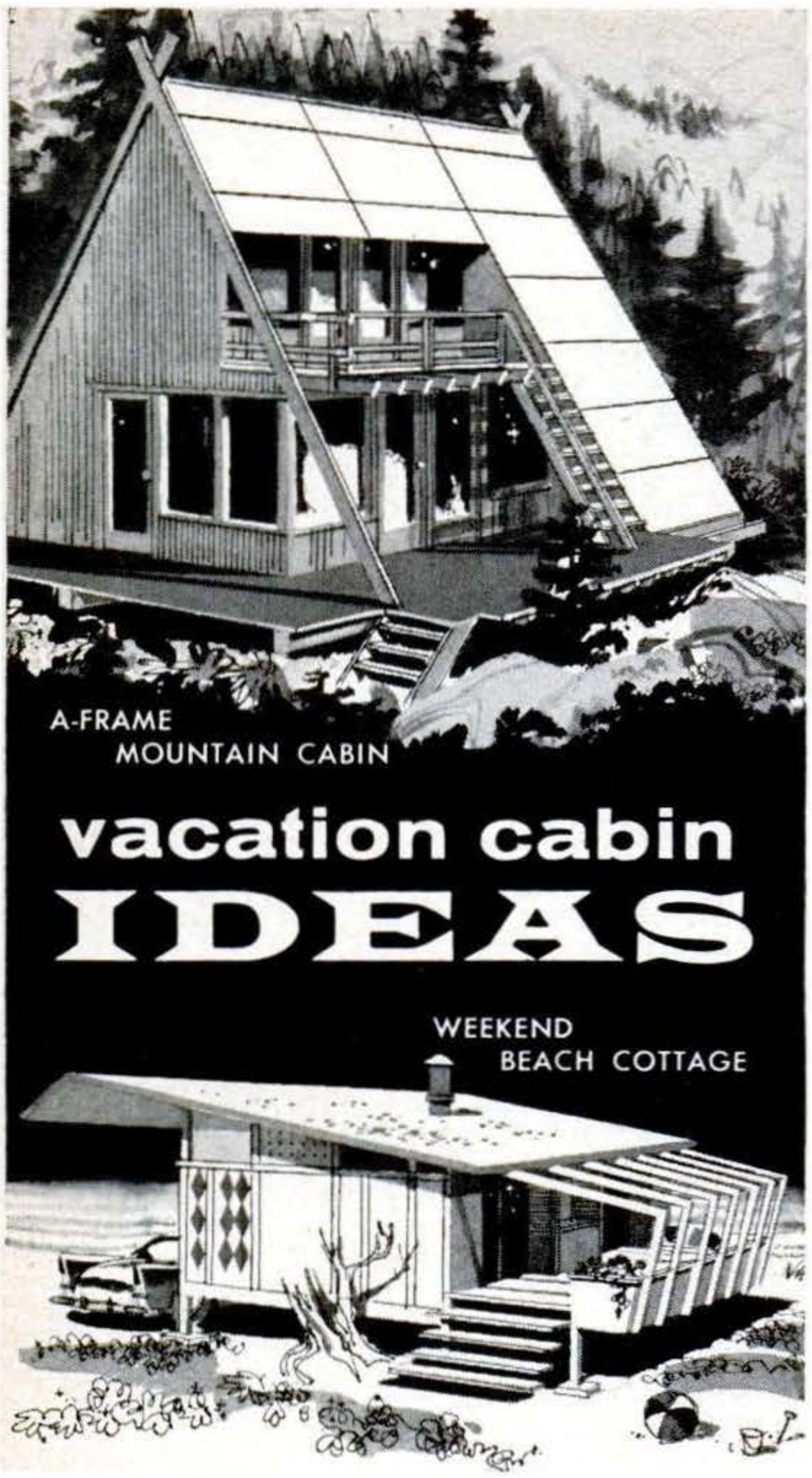

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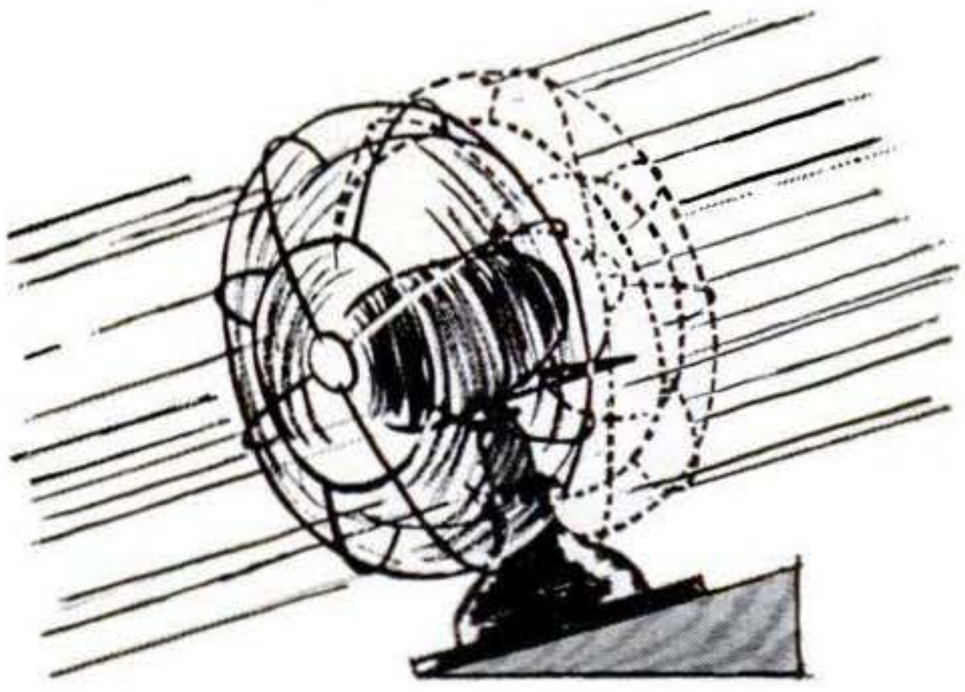
There was no place to mount the fan except on the single floor post. Our big lathes could not, of course, be shifted.

"You want a breeze around you but not on you," I told Ed. "I want it right on me. Maybe we better get two fans."

"Heat would be over before a requisition went through," he answered. "But I know a way we can both have what we want with one fan."

Setting the fan to oscillate again, he blocked up one side of its base so that the oscillatory axis was on a slant. When the fan turned toward me, it blew downward. When it swung toward him, it blew well over his head. That dodge spared our tempers, saved the day—and our friendship.—*Bert Wheelock, Akron.*



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POPULAR SCIENCE
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Wh

Don't believe everything you hear about small cars made-in-U.S.A.—it's just about the most ticklish decision Detroit has ever had to make. Here's why

By Devon Francis

AMERICA'S biggest auto manufacturers, General Motors and Ford, have taken their first major steps toward the production here in 1959 of "small," European-like cars. The engineering and styling work has been done. The blueprints are made. Some cars, heavily disguised, have been seen on the test track.

And here a word of caution: Be wary of any pictures you see of "Detroit's proposed small cars." Whatever appears in print in the next few months is a guess and no more. For even their makers haven't fully settled on what the vehicles might look like.

Detroit executives who have to decide whether to go ahead with the production of small cars aren't sleeping well these nights. If they do go ahead, it will mark a major change in the character of Detroit's output.

Don't bank on it that they will. This isn't the first time in recent years that Detroit has flirted with the small car. Both GM and Ford had small cars on the test track in 1946-47. Both wound up in dusty storage rooms. That may *not* happen this time. Reluctantly, the manufacturers may go ahead with their small-car plans. They may be forced to.

If these companies do give their production people a green light, they will produce vehicles that are "small" only relatively. They will be roomier than most of the current imports selling for $2,000. Their retail price, at the factory, will be under $2,000, and just possibly as low as $1,800. These cars will *not* compete in price with the lower-priced imports.

They may not even compete in quality. GM's President Harlow Curtice is author of the statement that when auto manufacturers begin paring costs, they destroy value faster than they drop prices.

Engine powers of the domestic small cars will be low. Some have been designed with four cylinders, some with six. At least one of the sixes, designed by GM, is an air-cooled, "flat" engine with opposed cylinders. A pancake engine permits a lower hood (or rear end, if a rear-engine car). But the engine's width puts it into competition with the wheel wells for space in the body. It is also more expensive to manufacture than an in-line, because two heads are required, and extra boring operations on the block.

While pancake engines have been used in Europe for years, little effort has been made to develop them here. The latest was pushed by the late George Mason, president of Nash, shortly after World War II. It never got beyond the experimental stage.

Alternative plans exist among the Detroit manufacturers for front-engine cars with rear-end transmissions, and for cars with both engines and transmissions in the rear. A flat floor pan, uninterrupted

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by a transmission hump and drive-shaft tunnel, would permit a lower roof line and a prettier silhouette than those of the bulk of the imports.

The winter's first snow will be on the ground in 1959 before (and if) these cars appear on the showroom floor. The reason is the "lead time" required to produce a new car. The 1949 Ford, for example, incorporating Ford's first postwar changes, required 19 months from incubation to production, even under an expensive "crash" program.

Why are GM and Ford dragging their heels over a decision to produce small cars? And what's happening with Chrysler, the third member of the Big Three? It's a complicated story.

Here are six powerful reasons why none of these companies *wants* to produce small cars:

1. Small cars would be a gamble on public taste.

Notwithstanding the growing popularity of American Motors' smallish Rambler, and the booming sales of imports, Big Three executives suspect that the market for small cars is limited. Of the new automobiles sold in this country in 1957, only one in 20 was a small one, even with Rambler included. Only one in 30 was an import.

In exploring the subtleties of buyer choice, manufacturers wonder if the U. S. motorist who buys a small foreign car would necessarily buy a small domestic car. The foreign car standing in the driveway has prestige value. A small domestic car in the driveway might call for explanations to the neighbors.

GM's Chevrolet division has stated that it would be interested in making a small car only if the demand rose from one buyer in 20 to one in 12.

Put yourself in the uneasy chair of the president of one of the Big Three: What would you conclude from the fact that the cheapest models of Fords, Chevrolets and Plymouths were also the least popular? From the fact that the outsize, bespangled and relatively expensive Oldsmobile is outselling all the European imports combined? From the fact that Chevrolet has had to boost production schedules on its costly Impala model several times?

'59 Cars: Bigger, Cheaper to Run

DETROIT'S 1959 crop of new cars will be announced, almost without exception, substantially earlier than usual. Some of the cars may even appear in showrooms at the tag end of August in token of the manufacturers' anxiety over low sales on their 1958 editions.

The biggest news: The "horsepower race" is over. Many of the manufacturers will "de-tune" their engines by installing camshafts that will save gas, and reduce power outputs.

By brands:

- Chevrolet will share sheet-metal body panels with Pontiac, Buick and Oldsmobile, even as Plymouth, Dodge, De Soto and Chrysler have been doing for two years. The Chevy, with a brand-new look for the second straight year, will be bigger than ever.
- Ford, reviving a long-forgotten slogan, will attempt through a completely new body to become, once again, "the universal car." Those rabbit-ear fins will disappear. Ford Motor gradually will begin using some of the same body dies for the Ford, Mercury and Edsel, as a manufacturing economy.
- Plymouth, in common with the rest of the Chrysler Corp. stable, will undergo a "major face lift." The fins will stay and even gain emphasis. The corporation will offer optional air springs, but on the rear only. Torsion bars will be retained in front. Chrysler Division cars will adopt the "Ferrari look" of the Chrysler 300. Electric fuel injection is being abandoned on the 300, the only corporation car boasting it.
- Oldsmobile, Buick and Pontiac will

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domestic car might mean explanations to the neighbors

2. Small cars inevitably would cut into the sales of the Big Three's bread-and-butter cars.

Chevrolets, Fords and Plymouths produce good profits. Small cars would bring small profits. Moreover, higher labor and material costs over here would put the squeeze on profits on small cars if they were to compete with more economically produced European imports, even counting ocean transport and tariffs. Volkswagen abandoned plans to manufacture its car in this country—it proved cheaper to make it in Europe and ship it over.

3. Domestically produced small cars would pose a thorny sales problem.

Who would sell them—the Chevy, Ford and Plymouth dealers? Automatically, that would jeopardize the sales of the bread-and-butter cars. The alternative would be to set up a whole new apparatus of dealerships—a fabulous expense.

4. U. S.-made small cars would compete with GM's and Ford's own European-produced small cars.

These companies have gone to a lot of expense to set up their import arrangements. Would all that money be wasted?

5. Small cars manufactured here would compete with domestic second-hand cars.

The sale of second-hand cars is vital to the automobile business. Motorists don't buy new cars unless they can trade in their old ones. The old ones must be sold, too.

6. To produce small cars here would require investing millions of dollars in tools and dies.

If production were limited, how could this money be written off? By keeping the same body style over a period of years? But would the U. S. motorist who is content to buy a Volkswagen that almost never changes be equally happy about a 1963 Ford or Chevrolet that hadn't changed since 1959? And, if the small car actually did catch on at the expense of costlier models, how would a manufacturer write off his investment in tools and dies for the glittering chariots to which he is now committed?

So much for why Detroit skitters at the apparition of the small car. But at least eight equally compelling reasons

[*Continued on page 212*]

all have new garb. The Olds will be an even bigger, flossier car, with more glass area and a higher-displacement engine.

● Buick, retaining but modifying the "sweepspear" chrome molding, will have improved brakes.

● Cadillac, for the second time in a decade, will have a new engine block and, of course, a higher displacement. The new models will appear in Caddy's "cycle year," which means that they'll have new bodies.

General Motors, unhappy over the bleak, unblinking look that four eyes give to its cars, has been experimenting with putting the second lamp in each fender below instead of beside the main one.

Another possibility under consideration is putting the two extra lamps together, centered just above the bumper.

● Edsel, with sales low and production practically at a standstill, will be face-lifted. Those up-and-down lines in front will remain. Emphasis will be shifted from the higher-priced Corsair and Citation lines to the lower-priced Ranger and Pacer, sharing some sheet-metal panels with the new Ford. The Mercury will have a spanking new body, not shared with the Edsel.

● Lincoln and Continental will undergo little change.

● American Motors will make only skimpy changes for 1959.

● Studebaker-Packard will "cycle" on looks except for the Scotsman economy models.

Prices on the medium-price and high-price cars probably will be up. The manufacturers of the Ford, Chevrolet and Plymouth plan to lower the prices on a number of their models. Whether they do will depend partly on second-guessing in the light of new contracts with the labor unions.

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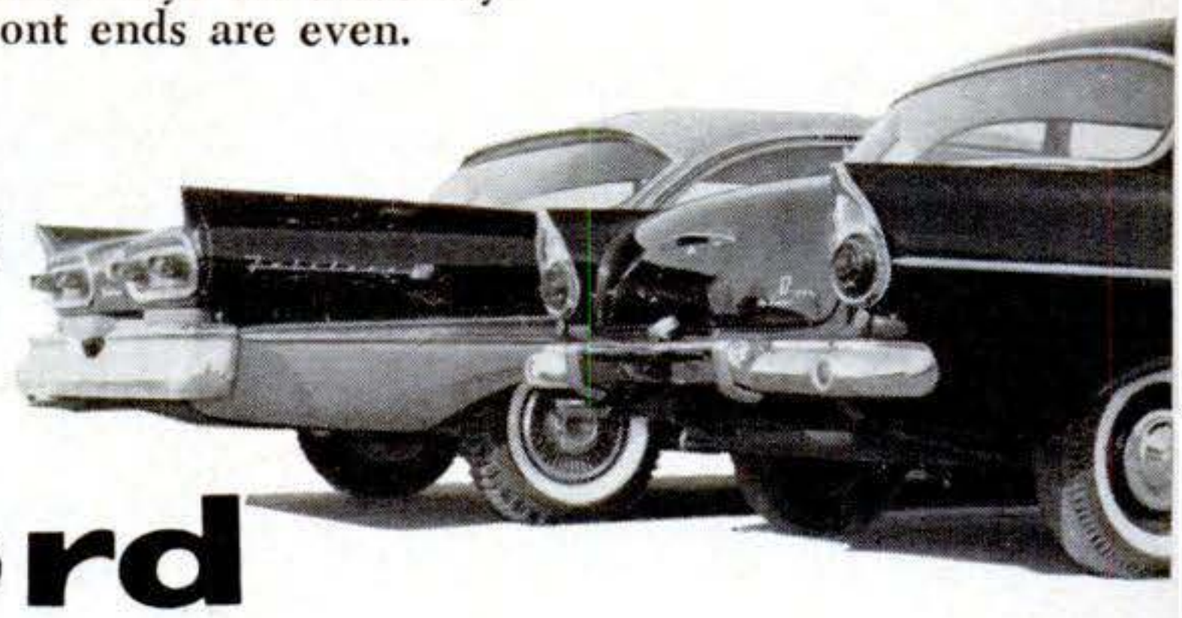
BLOOD COUSIN to domestic Ford, Taunus' lineage shows up in striking resemblance. But it's almost three feet shorter, can sit crossways on driveway. Photo below shows it tail to tail with '58 Fairlane. Front ends are even.



Driving the Little German Ford

Taunus, newest import, comes complete with unitized body, 67 hp., and American accent

THE Ford Motor Co. last month began mongering through some of its agencies in this country a motor vehicle that bore the following imprint on its cast hardware: "Ford-Werke Aktiengesellschaft." Reduced to pronounceable dimension for the potential customers in Burbank, Beloit and Bangor, this jawbreaker meant that here was a car made by a Ford subsidiary in West Germany.

Ford finally has decided to toss its German product into the melee of foreign car sales over here, even as General Motors has done with its Opel.

The move was an event of more than passing interest. First, while the automobile, called the Taunus, is all-Ford outside, it's strictly Deutsch under the hood. Second, the Taunus is not quite like anything that Ford is selling over here from its British factory at Dagenham, and the home office may be using it to get a further reading on the American market for small cars.

Everyone in Detroit, Ford included, is morbidly curious as to why motorists buy automobiles smaller than Chevies, Fords and Plymouths. The Taunus may supply yet another answer.

By U.S. standards, the Taunus is pert. In its station-wagon version it probably could win a beauty contest, either here or abroad, hands down. Interiors are strictly out of the Ford styling department on Dearborn's Oakwood Blvd. The instrument cluster—in particular, the shrouded speedometer, which Ford advertising people like to call the binnacle, old boy!—looks as though it had been borrowed out-

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right from the Ford car of a year or two ago. So do the round, high-mounted tail lights.

And it bears a fascinating coat of arms: so help me, three bottle caps along with—count 'em—11 bottle openers, rampant on a field of white.

The little, 67-horsepower, four-cylinder OHV engine wouldn't cause a riot at a drag race, but it does commendably well for its displacement. It will reach an honest 78 miles an hour. It manages zero-to-60 in 21.6 seconds and in the passing range will accelerate from a constant 40 to 60 in 12.4 seconds.

The gas mileage is not sensational. At a constant 50 miles an hour the Taunus got 23.6 miles per gallon. That's several cuts below the gas economy of many of the other European imports, but then they don't have the performance, either.

Where the Taunus (named for a German mountain range) shines is in comfortable seating, a fairly soft ride and good handling characteristics. It's also pretty good on the power output for its engine size—.65 horsepower per cubic inch. That compares with .59 horsepower for the Consul, the only comparable automobile that Ford produces abroad, and with .61 for GM's Opel [PS, Mar.]. None of these cars, by the way, can hold a candle to the Swedish imports [PS, May] on power production per cubage.

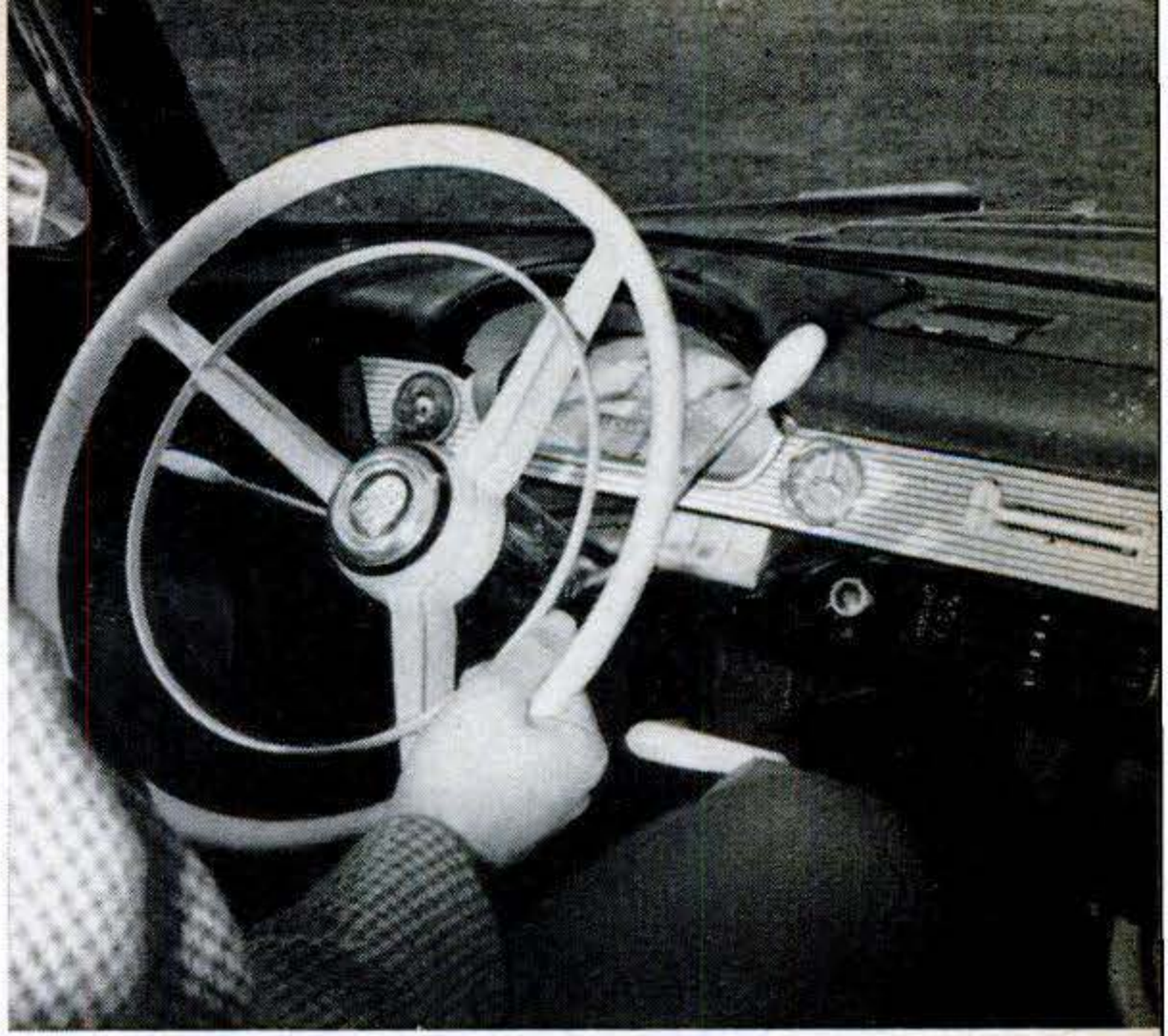
The innards of the Taunus are German not only because they were engineered in the metric system but also because they reflect that celebrated German gift for precision.

The Germans take no nonsense. An American mechanic, questioning an electrical installation in the car, was fixed with a stony stare by a German mechanic and told, "Ess vaas so ge-built." It's a safe bet that ess vill run so practically indefinitely, too.

The Taunus differs from Ford's British Consul in several respects. It's priced higher. The standard German four-door sedan retails in New York and Gulf ports for $2,159 with heater, the Consul for $2,012. Taunus prices shoot clear up to $2,275 for a "deluxe" station wagon.

At 2,240 pounds curbside, the Taunus weighs 265 pounds less than a Consul. It has a weight-to-power ratio of 33.4 pounds compared with the Consul's 41. That

[Continued on page 204]



INTERIOR IS U.S.-STYLED, from depressed-center steering wheel to crash padding. Simple slide switches on the controls bear international picture symbols. Heater comes with the car.

TOP ANCHORAGES for front coil springs, with removable tops for greasing (shown with hand), project into engine compartment. The engine bore is 3.31 inches, the stroke 3.02 inches.

A TALL MAN HAS TO DUCK to enter, despite the Taunus' unladen height of 59 inches. Backs of front seats are adjustable. Unitized body, with swing-out rear windows, can't squeak.

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A power more menacing than the H-bomb will be wielded by the first nation that learns how to use:

Weather as a

By Capt. Howard T. Orville, U.S.N. (ret.)
as told to John Kord Lagemann

Captain Orville charted the weatner for the Doolittle raid on Tokyo and was a weather advisor for the North African invasion and for naval operations in the Pacific. He was appointed by President Eisenhower to serve as chairman of the Advisory Committee on Weather Control that submitted its report a few months ago.

The subject of this article is a highly controversial one. Meteorologists and scientists differ widely as to when, how and to what degree we shall be able to control the weather. But there is no dispute over the view that weather control merits serious consideration and research.

IMAGINE all North America turned into a thousand dust bowls where no green thing grows. Fierce winds blacken the sky with dust clouds. The Great Lakes recede into swamps, the mighty Mississippi dwindles to a string of muddy ponds.

Or reverse the picture. Cleveland, Chicago and other cities lie deep under the raging waters of the Great Lakes. The fruitful Mississippi Valley is one vast inland sea. Coastal cities from Boston to San Diego are ocean beds.

These twin nightmares, with their concomitants of dying cities, disease and famine, were the sober concern of a recent meeting of the Senate Military Preparedness Committee. On the stand was H-bomb physicist Dr. Edward Teller, who testified that the United States could be beaten without war if Russia was first to control the weather on a global scale.

He wouldn't be surprised, Dr. Teller told the committee, if the Russians did achieve such control during the next five years—or if it took fifty.

"Control of earth's weather and temperature is within the realm of practicability now," says Dr. Joseph Kaplan, chairman of the International Geophysical Year.

These and other scientists make it clear that weather control is a challenge to be faced in our lifetime. Used wisely it could turn the earth into a Garden of Eden. As a weapon, it could be more disastrous than nuclear warfare.

How can we change the weather when we cannot as yet even predict it with 100-percent certainty? Although research on both fronts is interdependent, it is hard to say which may come first. Bear in mind that medical science can now prevent polio and cure pneumonia, while still unable to cope with the common cold.

Cloud seeding, the first method that comes to mind for controlling weather, is of little importance because it is effective only in limited areas under favorable conditions. But present knowledge lists seven possible ways of changing weather on a global scale:

- Rocket-spread gas clouds to increase or decrease the amount of solar energy reaching the earth.
- Electronic bombardment of the ionosphere to alter its electrical charge.
- Controlled thermonuclear reaction to heat great areas of the atmosphere.
- Reflectors on space platforms to concentrate the sun's rays on the earth.
- Heat-absorptive substances spread on the polar ice caps.
- Dye, oil or vegetation on ocean areas to alter their reflective properties.
- Chemicals on the ocean surface to affect evaporation and thus rainfall.

All these methods would regulate the distribution of heat in different parts of the earth's atmosphere. This is the basis of global weather control.

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Weapon

Visualize the atmosphere as a tremendous solar battery, constantly being charged with 127,000,000,000,000 (127 trillion) horsepower of energy every day in the form of ultra-short-wave radiation from the sun. The upper atmosphere filters out some of the harmful rays, but most pass through with no effect. The earth absorbs their energy, is warmed by part of it, and transmits the rest back to the atmosphere as heat.

Because this heat is in the form of infrared rays of far longer wave lengths than sunlight, much of it is trapped by the atmosphere and stored in water vapor or clouds. But this action is not uniform; some parts of the earth absorb more sunlight and re-radiate far more heat than others.

Ice and snow reflect most of the sun's energy back into space, where it is lost to earth forever. Deserts, even the hottest ones, also bounce back most of it. But oceans and forests absorb the major part and pass it back to the atmosphere.

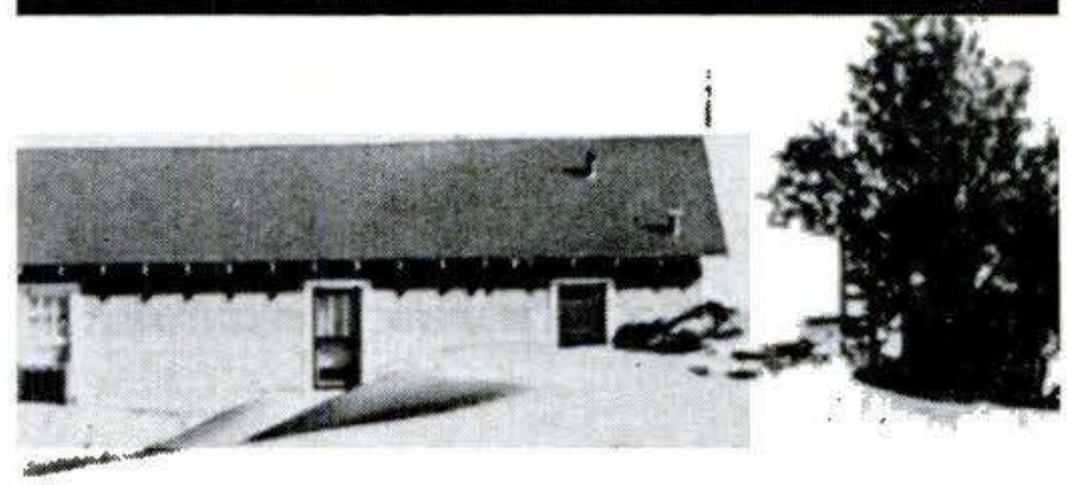
This spotty action of the earth's surface causes uneven accumulations of energy in the atmosphere. Wind and weather are the result as this uneven heat distribution seeks equilibrium.

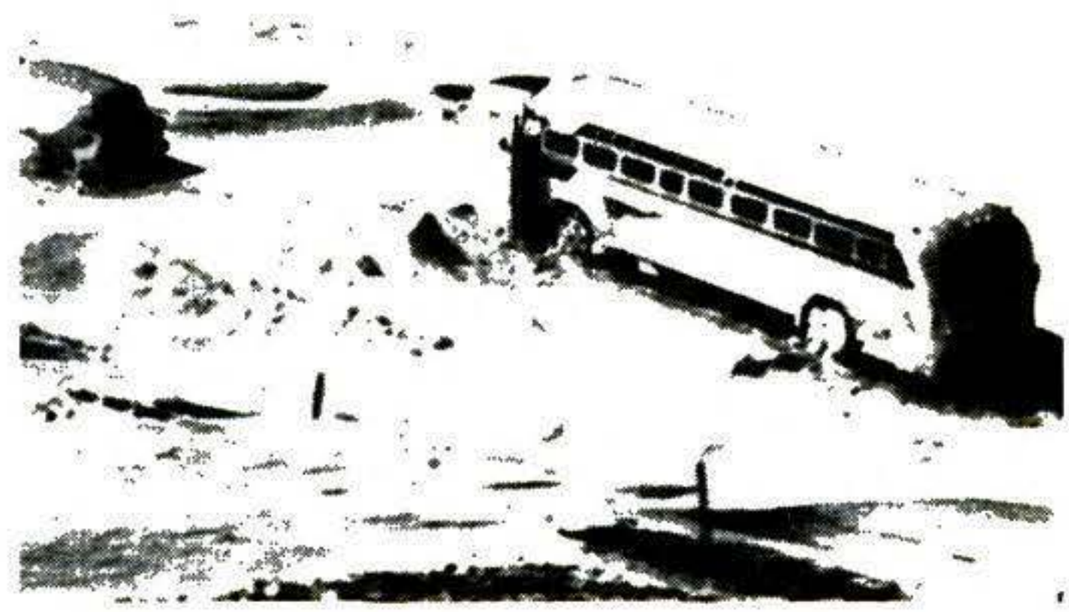
What leverage can we exert in this gigantic weather mechanism? We can never expect to control the sun, which is the source of all our heat. But new knowledge of the upper atmosphere, now being gained from rocket flights and satellites, may enable us to control the amount of solar energy that strikes the earth.

Air Force scientists are already experimenting with sodium vapor, ejected from jet planes, to intercept solar radiation. Other gases would admit solar radiation but trap heat reflected back from earth. The last half-century, during which we have burned huge amounts of fossil fuels, has shown what an increase in atmospheric carbon dioxide can do. The amount spewed from chimneys and automobiles

Man is still at the mercy of the weather

Even now, abnormal weather can defeat our well-equipped civilization. Photos below were taken in Texas in past two years. Suppose man learned to aim and time such storms . . .





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in five decades has created the so-called "greenhouse effect," which has raised the earth's temperature by an estimated two degrees Fahrenheit—a significant rise.

This so-far accidental result is already serious, according to Dr. Kaplan, and we must find means to counteract it. "Melting polar ice will make ocean levels rise at least 40 feet, and inundate vast areas in the next 50 or 60 years," he warns, "unless atmospheric temperatures are controlled."

Electricity plays a part in determining our weather, high-altitude data already available suggests. Of particular interest is the ionosphere, that electrically charged outer layer of the atmosphere that reflects radio waves back to earth beyond the horizon of the transmitter.

This negatively charged shell can be thought of as one plate of a huge condenser. The other plate is the earth's surface, which is positively charged in relation to the ionosphere. Serving as conductors between the two plates, and so tending to neutralize their charge, are ions—air molecules electrically charged by cosmic rays or by earth radiations.

Any increase in the ion content of the lower layers of the atmosphere increases the electrical leakage between the ionosphere and earth. During the last few years, ions created by hydrogen-bomb explosions have done just this, lowering the electrical potential of the air near the ground. There is some evidence that this boost in ionization has resulted in more lightning activity.

We may find other ways to manipulate the charges of earth and sky and so affect the weather. One means might be an electronic beam to ionize or de-ionize the atmosphere over a given area.

Controlled thermonuclear reaction may be a powerful instrument for affecting the heat balance in the atmosphere and so changing the weather. Enough heat to warm a city or even a continent is not beyond the realm of possibility, once we succeed in releasing atomic energy from such plentiful forms of matter as sea water and granite.

Huge space platforms, which few doubt we will be able to put into the sky in the next decades, would make it possible to mount huge reflectors or lenses to focus the sun's rays at any desired spot on earth. Such heat beams could warm our cities—or set them on fire.

Perhaps Senator Lyndon Johnson had this in mind when he told the assembled House and Senate recently: "From space one could control the earth's weather, cause drought and floods, change the tides and raise the levels of the sea, make temperate climates frigid."

Changing the weather from outer space or with nuclear heat plants may seem more fantastic than these proposals really are. The space age has just begun; our human imagination is still earthbound.

For centuries mankind has practiced a form of accidental and usually detrimental weather control by cutting down forests, draining lakes and swamps, and exhausting the fertility of farm lands. All these have increased the wasteful reflection of solar heat back into space, cut rainfall in some regions, and helped to create deserts like the Sahara. But there is a constructive hint in this.

Change reflective properties of big surface areas, and you influence the weather. Alaskan farmers even now add an extra two weeks to their short growing season by spreading lampblack on snow-covered fields and using sun reflectors to speed up melting. An untreated snow or ice field absorbs only 10 to 20 percent of the sun's rays; a blackened one absorbs 70 to 90 percent, melts faster, and warms the soil.

New strains of cold-resistant cereal grasses are extending the green belt farther north in the sub-Arctic regions of Russia and Alaska. This increases heat absorption, delays formation of a snow blanket in fall.

Russia, having much territory in the sub-Arctic, has carried cold-weather farming much farther than we. Because her major rivers flow northward and she is land-locked to the south, Russia has put tremendous effort into research on making frozen lands habitable and finding a sea outlet through ice-locked northern harbors.

In such vast areas, the spreading of pigmented substances over ice fields, even by plane, can have little effect. But a heat-absorptive chemical fog spread over uninhabited ice fields by prevailing winds

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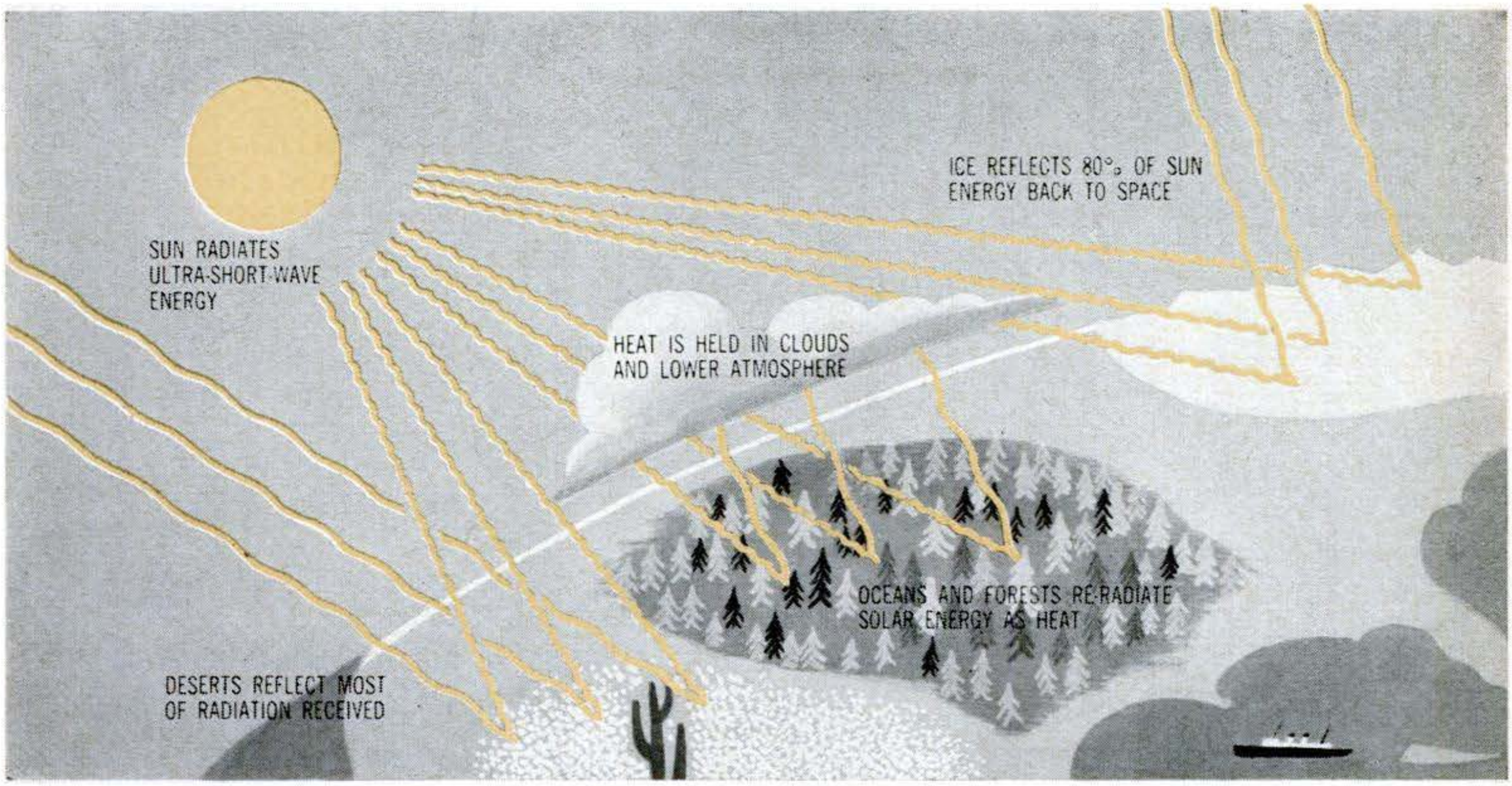
even without a war, to a second-rate nation



SOLAR HEAT arrives at the earth in the form of short-wave energy. Some is reflected and lost. The part changed to long-wave energy and returned to the atmosphere determines weather.

might some day make it possible to melt the polar ice cap. One result of that would be the sinking of our East Coast cities beneath the Atlantic, and the transformation of the Mississippi Valley into a huge inland sea.

Water covers two-thirds of the earth's surface. Altering its reflective properties would influence weather in various parts of the world. About half the heat energy absorbed by the oceans evaporates water that travels as clouds to pour rain on distant land areas. Sea water tagged with radio-isotopes from H-bomb fallout has enabled us to learn that certain regions of the earth get most of their rain from specific parts of the ocean.

In the doldrum belt near the equator, steady evaporation of ocean water stores up tremendous accumulations of heat energy in the atmosphere. Instead of dissipating itself in local and relatively harmless squalls, the tropical atmosphere becomes superladen with energy until it releases its fury in a hurricane.

Scientists believe that if we could break up the continuity of the reflective sea surface with patches of dye, floating islands of marine growth or burning oil slicks, such a colossal overall buildup of energy could be avoided. Smaller concentrations would dissipate without harmful results.

There are several chemicals which, when spread over the surface of water, drastically speed up or retard evaporation. A film of cetyl alcohol one molecule thick, for instance, substantially cuts down evaporation. Certain detergents speed up evaporation and cloud formation. Spread in large enough amounts, these chemicals could produce changes in rainfall either to flood certain parts of the earth or to turn them into deserts.

The Russians may be ahead of us in weather control, and this worries our scientists even more than the technical problems involved. "I shudder to think of the consequences of a prior Russian discovery of feasible weather control," says Dr. Henry Houghton of M.I.T. "Unless we remain ahead of Russia in meteorology research, the prospects for international agreements on weather control will be poor indeed. An unfavorable modification of our climate in the guise of a peaceful effort to improve Russia's could seriously weaken our economy and ability to resist."

We cannot trust to luck that we will be first to control the weather. The technical problems are staggering and there is much research ahead before we can get results. It may be later than we think. END

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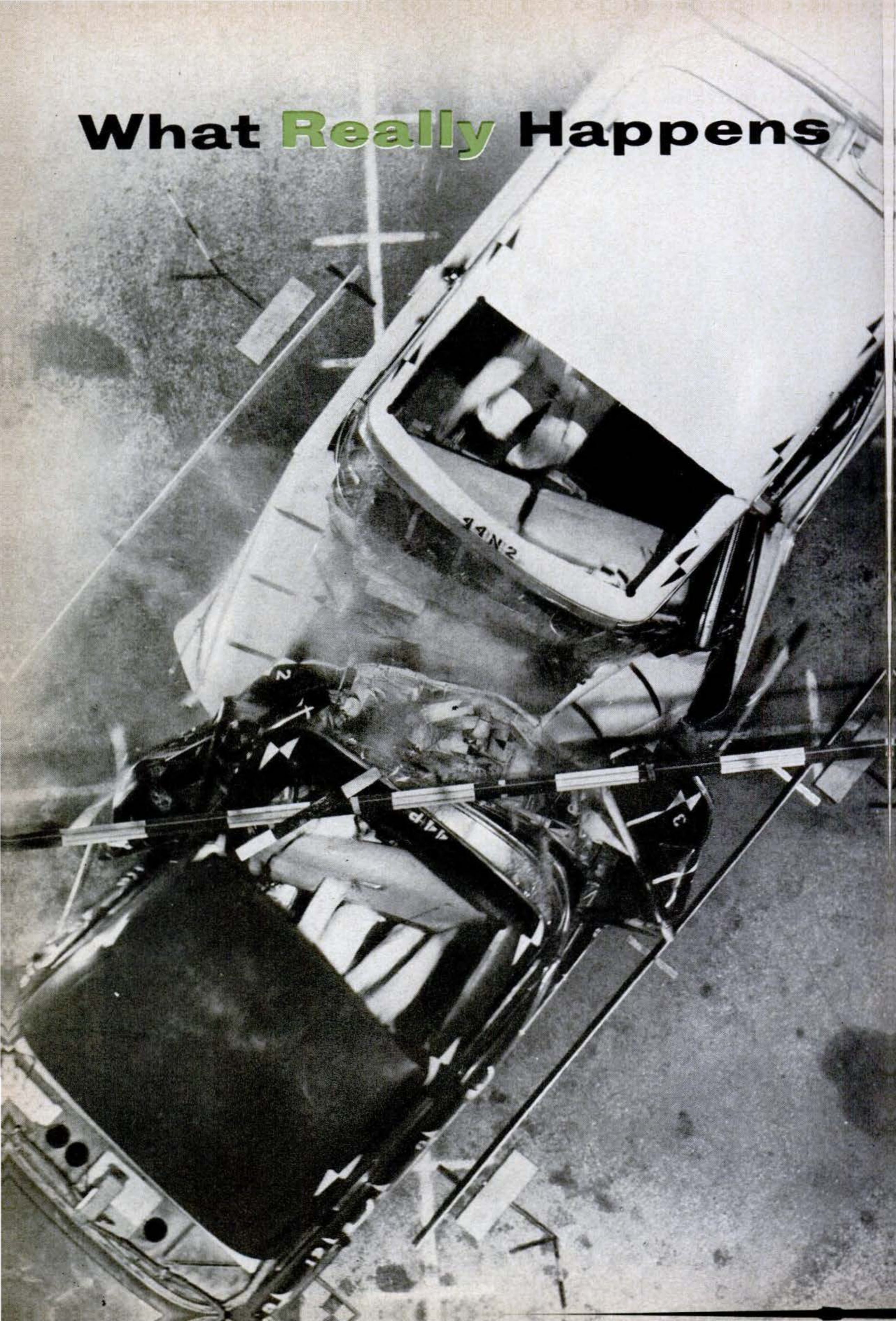
What Really Happens



in a Head-On Crash

Scientists staged 50-m.p.h. collisions to find out. Here are their conclusions on unit vs. frame construction, seat belts, safety locks, dished wheels

By Martin Mann

GLIMMERING in California's best sunshine while the Pacific lapped quietly nearby, two new sedans roared straight at each other down an old Navy runway. The solemn eyes of trim, handsome, ex-bomber-pilot Derwyn M. Severy watched closely. This was no hot-rodders' game of chicken. For the sixth time in four months, Severy was deliberately crashing good cars head-on. Object: safety.

What happens in a head-on collision at 50 m.p.h.? Could you live through one? How much help are the new safety gimmicks—belts, positive locks, pop-out windshields, dished steering wheels? What about unit bodies?

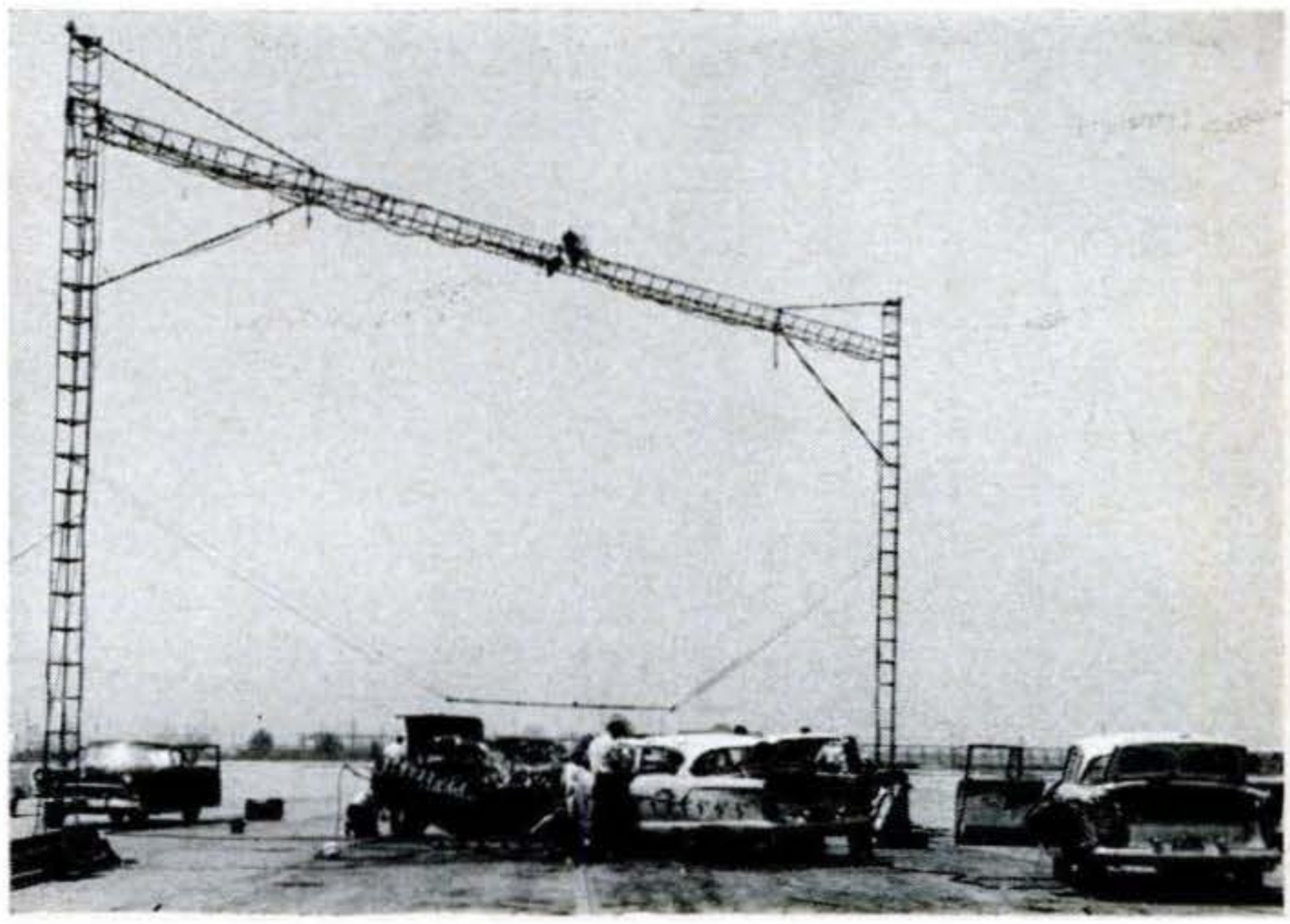
Now for the first time there are answers. Not the final word, but an initial report on Severy's meticulously conducted crash tests, the first ever to reveal what happens in a head-on collision at road speed.

The results do not flatter Detroit.

Severy, a dark, serious native Angeleno of medium height and very long title—Project Engineer for the Collision Injury Research Project of the Institute of Transportation and Traffic Engineering at the University of California at Los Angeles—has made safety his job since the war.

In this latest series of tests, he and his crew of 26 engineers, mechanics and cameramen smashed up 12 sedans: a '49 Ford, a '50 Nash, four '56 Ramblers, four '56 Fords, a '56 Pontiac and a '56 Nash Statesman. They rammed them together two by two, each pair colliding precisely 12 inches off head-on at precisely identical speeds (21, 27, 47 or 52 m.p.h., depending on the test). From miles of movie film, still photos and electrical recordings, some eyebrow-tilting results stand out:

- You could live through—but not walk away from—a 50-m.p.h. head-on collision.
- Your survival chances at any speed would shoot up if auto makers stuck to simple, well-known rules of safe design.
- New safety gadgets help—but do not work as well as they should.
- Type of construction doesn't matter. There was no clear-cut difference in crash performance between the standard body



HEAD-ON AT 52 M.P.H. a frame-bodied Pontiac (black) rams a unit-bodied Nash Statesman. Photo (shot from overhead bridge shown at right) seems to show the frame-and-body car getting the worst of it. But examination by scientists of cars and dummies established no clear safety advantage for unitized construction.

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bolted onto a load-bearing frame and the newer frameless type that welds all body sections into a single stress-resisting unit.

How did they find out? Staging a fast head-on collision—inside a test tube, you might say—turns out to be far more difficult than avoiding the real thing on the highway. The big bash lasts only around a tenth of a second. You want to measure everything: deceleration at several points on each car; forces on safety belts; movements of seats, steering wheel, and doors; how the glass broke; which way the dummies flew.

Some of this can be done electronically. Accelerometers—to measure G-forces—were spotted at four points on each car, inside the dummy drivers' chests and at the dummy passengers' hips. The signals were fed over a slack cable to oscillographs in an instrument car following each crash car.

But most of the data comes off film. There were five high-speed movie cameras shooting as many as 1,400 frames per second (that stretches a tenth of a second to more than five seconds), two Air Force gunsight-aiming-point movie cameras (200 frames per second) focused on the dummies from within each car, three standard movie cameras and three still cameras.

Three of the cameras pointed straight down from a steel bridge (built of antenna tubing for $300) exactly straddling the collision point. Four were positioned on the ground to get a full side view, and four others covered from an angle.

Setting up a crash is not easy. How can you be sure the cameras will catch the action? They have to be close up and aimed before the test starts. This makes things tough indeed. It means that the crash cars can't wander off course more than *one inch*. Their speeds must be identical, and within two miles an hour of the preselected collision speed. On top of that, the cars should be completely free during the actual collision, unconstrained by controlling tracks or cables.

Quite obviously you cannot use human drivers. (They couldn't steer accurately enough, anyway.) So what can you do? The scientists' answer is ingenious.

- Steering. Each car was guided by a plastic shoe, fastened to the front bumper and sliding inside a single U-shaped track that ran down the collision course. The track ended 20 feet from the impact point, so the car hit free, as required.
- Speed. Car No. 1 towed car No. 2. A cable from the rear of Car 1 ran to a sheave at the far end of its track, then back under Car 1 to the front of Car 2. Adjusting the length of the cable—just as you would the pull cord of draw draperies—made the cars collide right in front of the cameras. And the speeds of the two cars automatically came out identical. A hook on the guiding track disconnected the cable a fraction of a second before impact, so the cars hit free, as required.

Car 2 just coasted, its engine dead. Car 1 was started by pushing it (in gear, ignition on) to cruising speed with a power-assist car driven by assistant project engineer Arnold Siegel. The power-assist car then dropped back and a governor on Car 1's engine took over.

Cr-r-rash. Six times the UCLA scientists did this. First come two 12-to-16-hour days of setting up. Then the power-assist car starts the crash cars rolling toward destruction. The instrument cars, bulging with engineers and their black boxes, follow carefully alongside. At zero-minus-10 seconds, the engineers switch on oscillographs and GSAP cameras, and the instrument-car drivers brake, stopping 10 to 30 feet short of the collision point. At zero-minus-four seconds, Severy rolls the high-speed movie cameras.

At zero there's the awful crunch of crumpling sheet metal and shattering glass. At zero-plus-fraction-of-a-second there's quiet again. The engineers swarm over two priceless heaps of junk.

They fine-tooth-comb the cars and dummies. They lift the wrecks to make precise photos of the underbodies (superimposed on similar "before" photos, these reveal crash-caused body deformation). They even bring in outside experts to estimate repair cost (it gets up around the original cost of the car after collisions near 40 m.p.h.).

But not until weeks later are all the films, stills and oscillograph recordings processed and checked. Then Severy can tell you just what happened during that fatal tenth of a second. His report ticks

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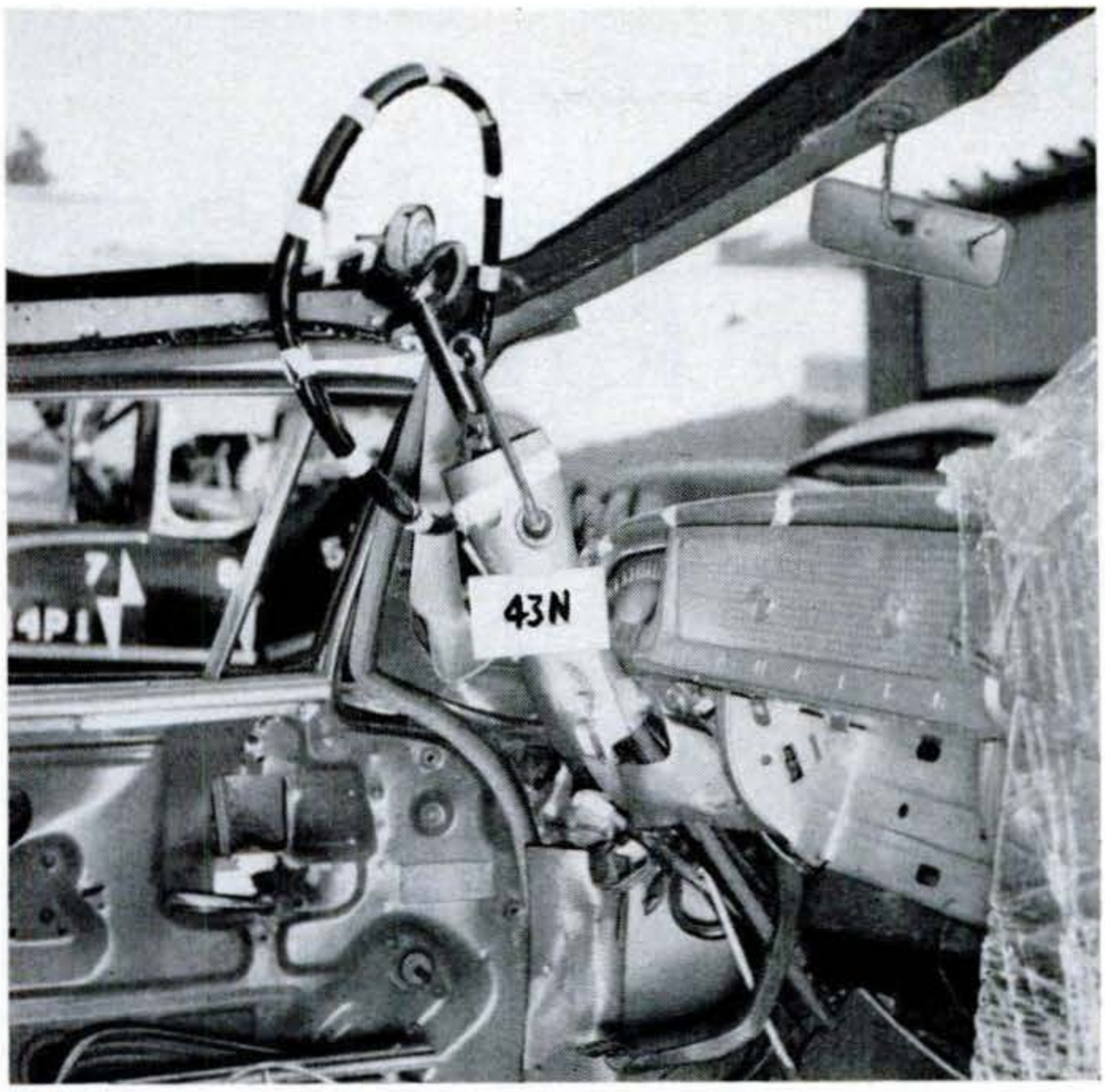
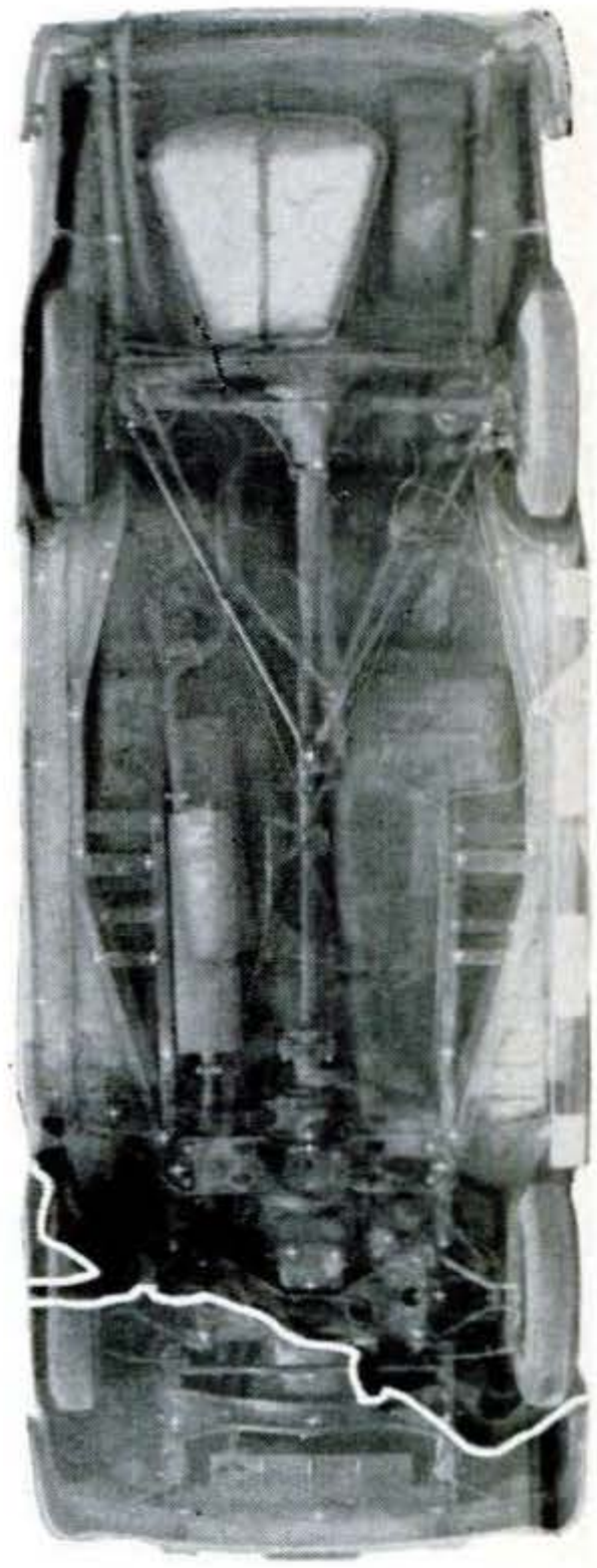
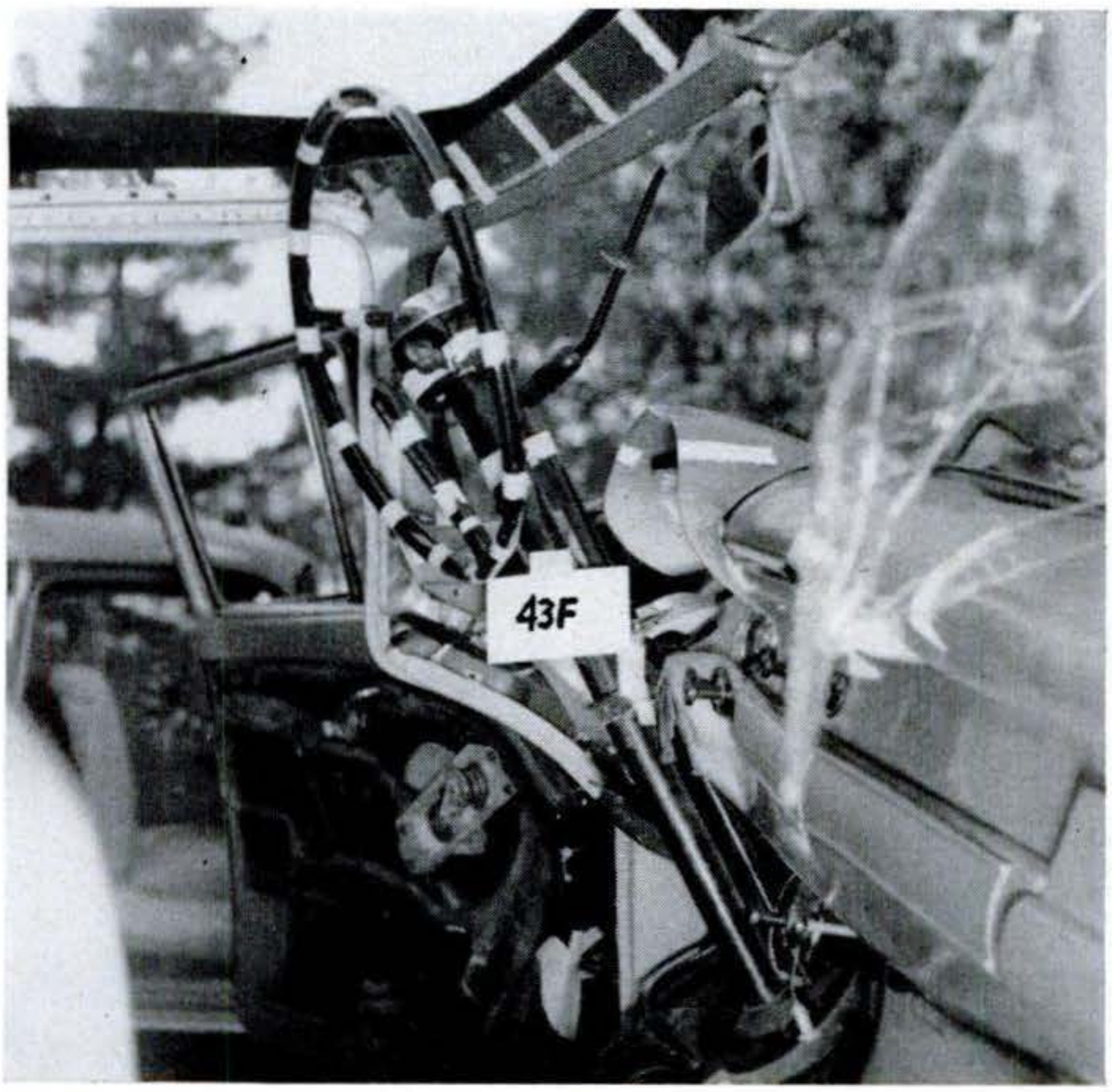
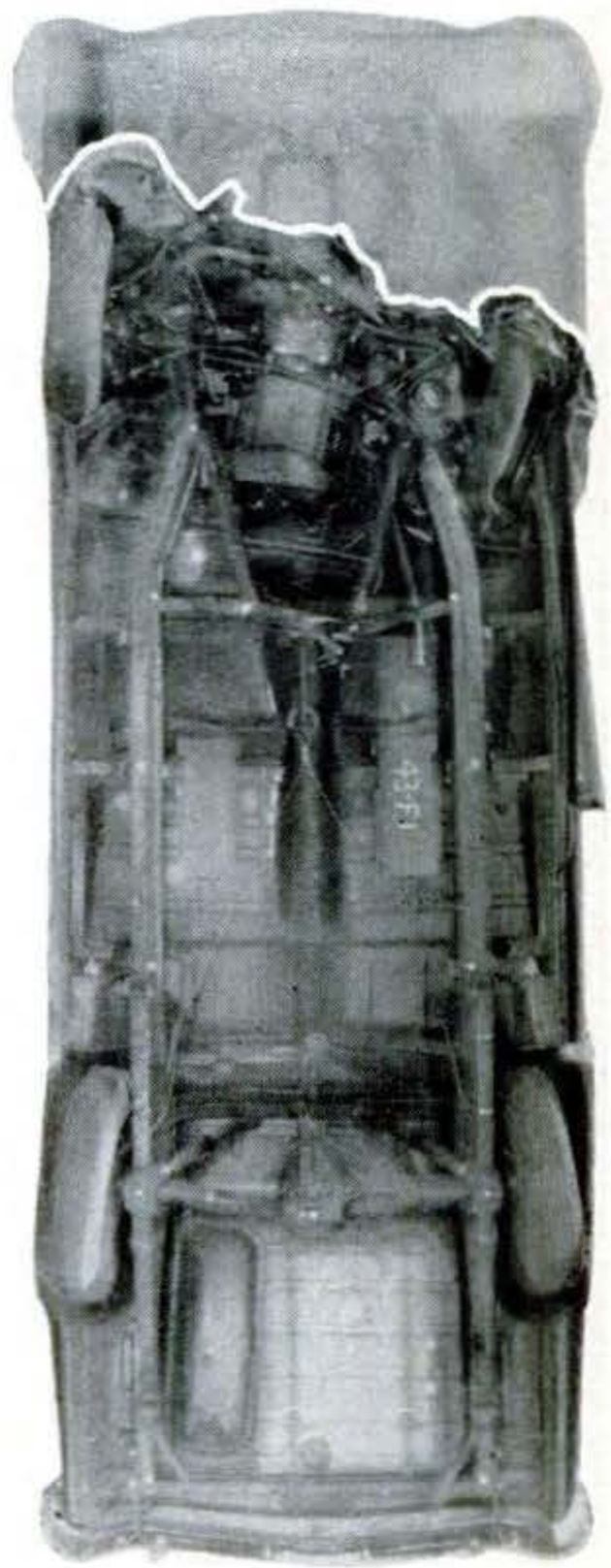
—and Detroit used more common sense in designing cars





RAMBLER AFTER 47-M.P.H. COLLISION: Steering wheel sticks through roof (hole was cut for camera view). Crushed underbody shows (right) in superimposed "before-and-after" photos.





FORD AFTER IT MET RAMBLER: Damage is similar. Only one dummy (safety-belt-equipped rear-seat passenger in Rambler) was considered a definite survivor of this crash.

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F-105 Thunderchief:

World's Deadliest One-Man Plane

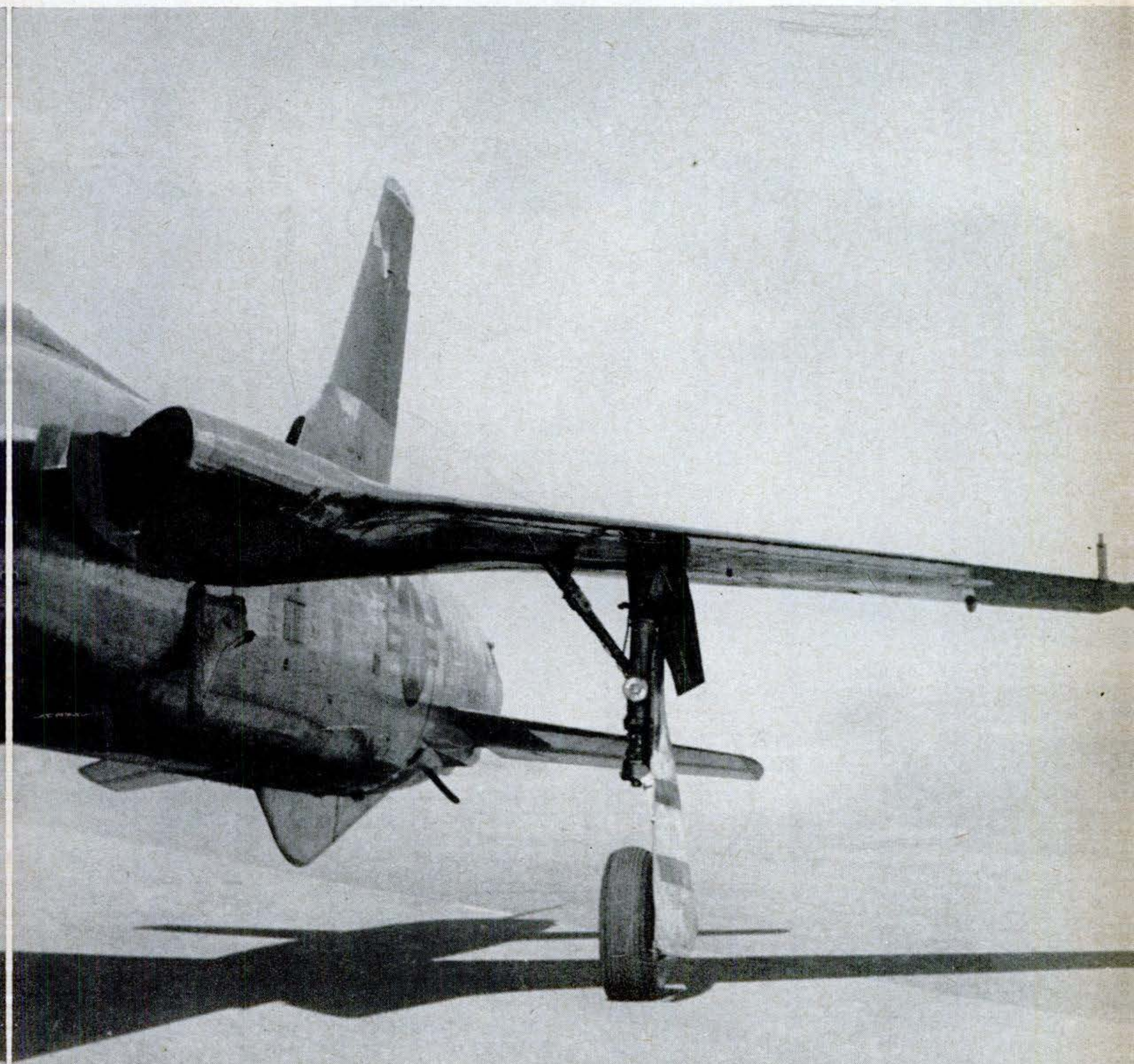
PS PHOTOS BY W. W. MORRIS

"A WELL-BEHAVED BULLET" is how test pilots describe this big brute. Unlike other Century series fighters (which sometimes went crazy and came apart when maneuvered violently at supersonic speeds) the sweptwing, 63-foot-long Republic F-105 fighter-bomber is docile as a lamb, through her whole flight regime, up to speeds "much faster than sound."

YOU are now looking at Republic's new supersonic, A-bomb-toting, globe-girdling F-105 Thunderchief. Nobody's saying exactly *how* fast the brute flies, but her J-75 engine is the most powerful in the world (15,000 pounds of thrust plus afterburner push) and the bird cruises above Mach 1. So Mach 2—or close to it—is no doubt under the pilot's left hand if he wants it. Experts call her the world's deadliest one-man plane.

The F-105 looks big as a barn from the side. From the front, she looks like a Vogue model on a hunger strike. She can bomb from very high (over 50,000 feet, which might put her out of sight of much ground radar, since she'd be buried in the "ion layer"). She can screech in on the deck under defense radar and sling her big egg like a shot-put before anybody knows Death is in the neighborhood.

With mid-air refueling—from a fast aerial tanker—the Chief can get up and go anywhere in the world, non-stop, carrying her big bomb inside her belly (fighter bombers up to now have had the



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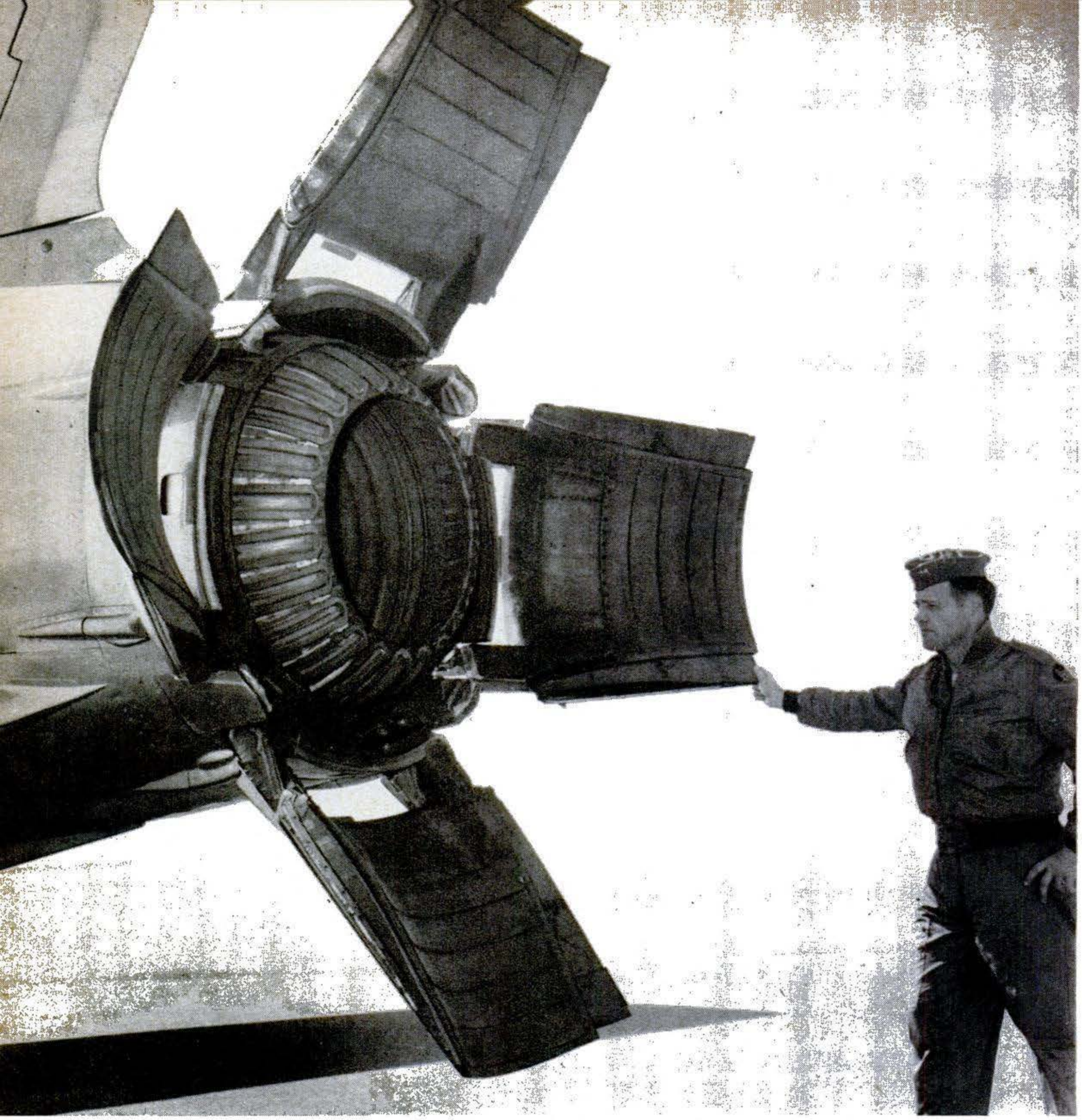

SKYHOOK is Republic's answer to supersonic bailout. Four stainless-steel petals snap open and haul the F-105 back through Mach 1 fast, so the pilot can be ejected safely.

egg tied outside, with lamentable loss of speed, altitude, range).

With the one-man crew, the short preflight check, the high-speed scramble ability, we could fling F-105s off the deck almost like peas out of a shooter. Or F-105s, with bombs and tankers, could fly a 24-hour alert against surprise attack.

The Chief can double as an interceptor. In her snout she carries the new Vulcan "gatling-gun" which hoses out 7,000 rounds a minute from its six revolving barrels, and sounds like an airhorn.

"The F-105 isn't as easy to handle as a Cub," says Don Seaver, her chief test pilot, "but she's certainly the best-behaved Century Series airplane I know of. The others used to swap ends in high-speed pullups and come apart—or get inertia coupling and yaw themselves to pieces. Republic has built a bird that you can wring out like a towel—supersonic—without getting in trouble. I know. I've done it."—*Frank Harvey*.

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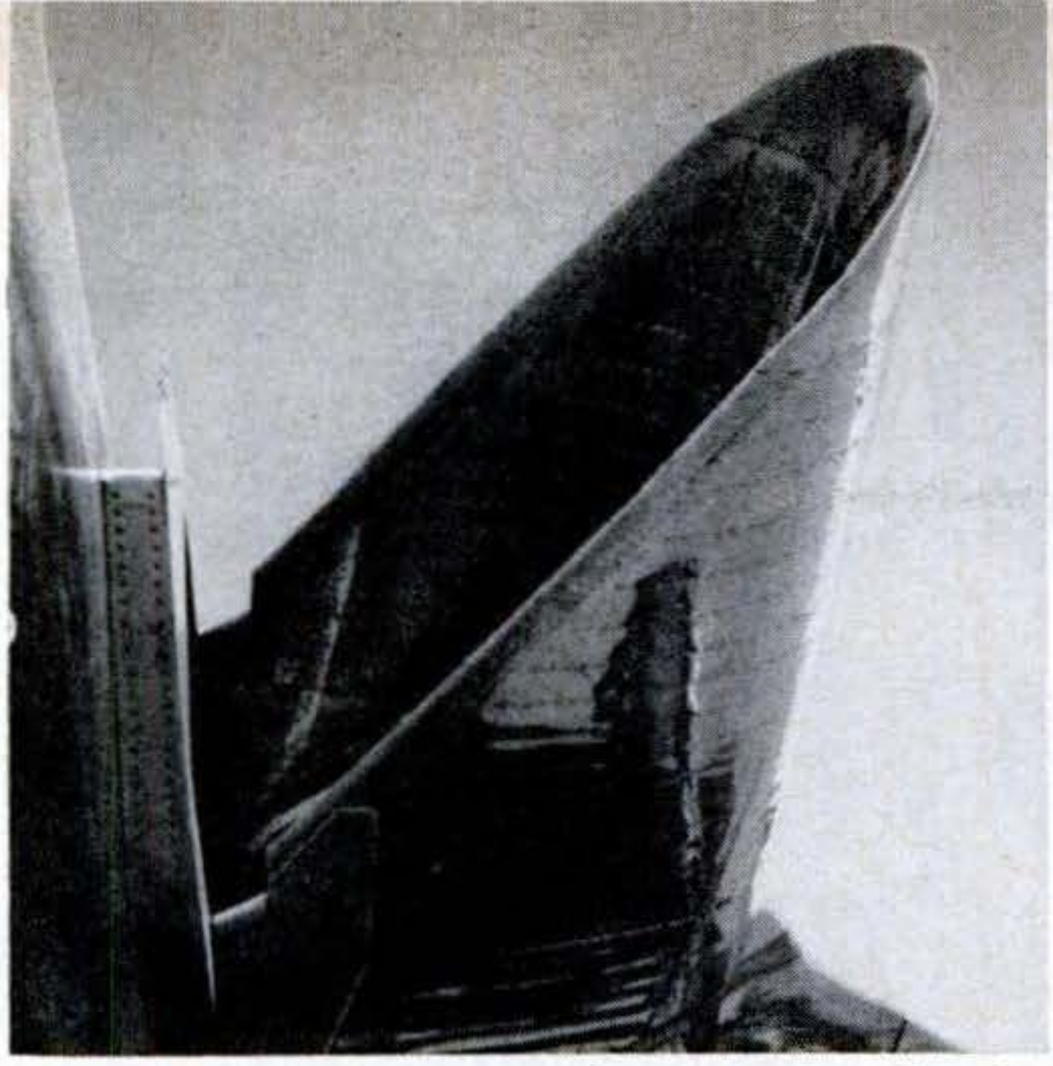
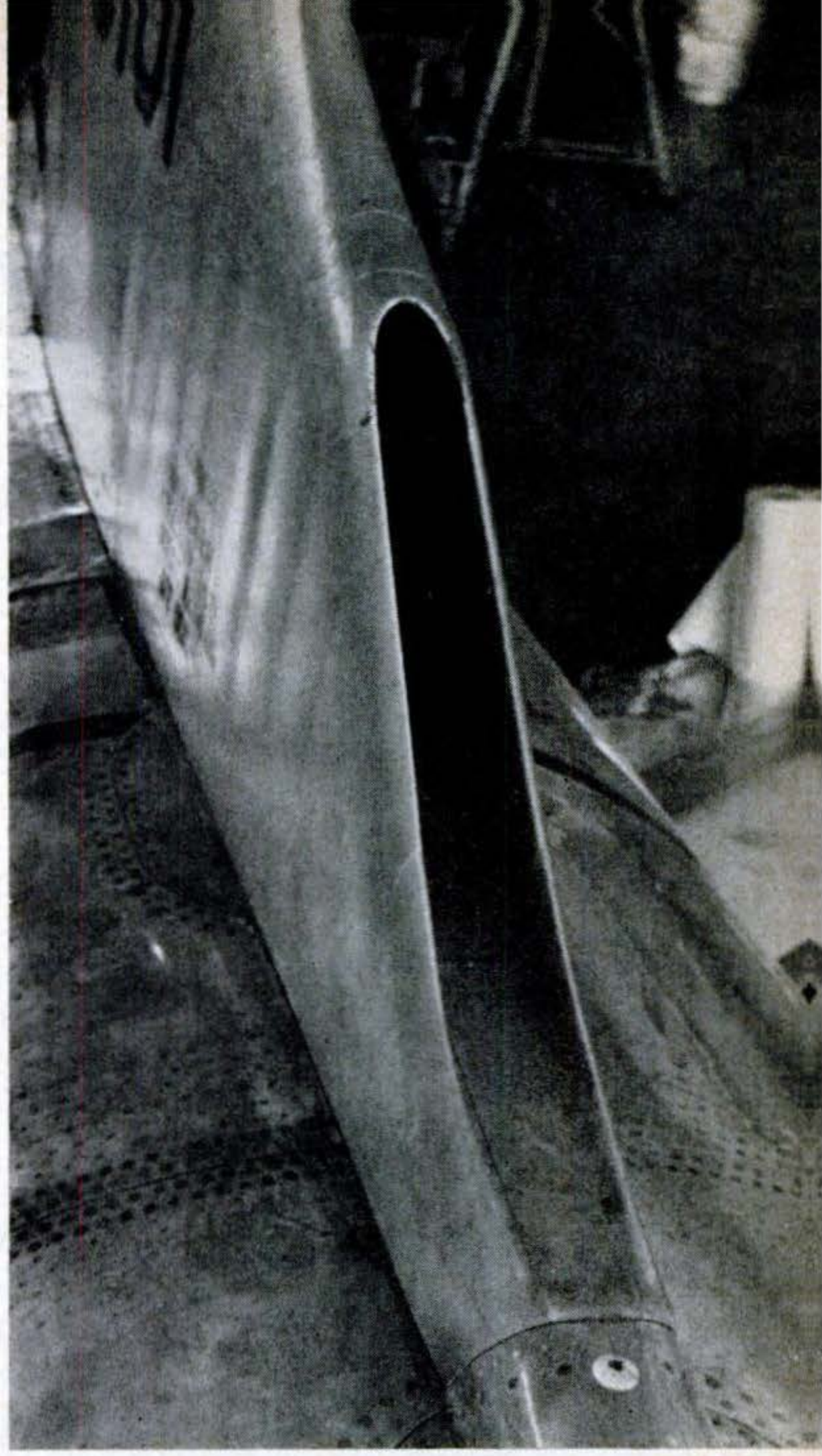


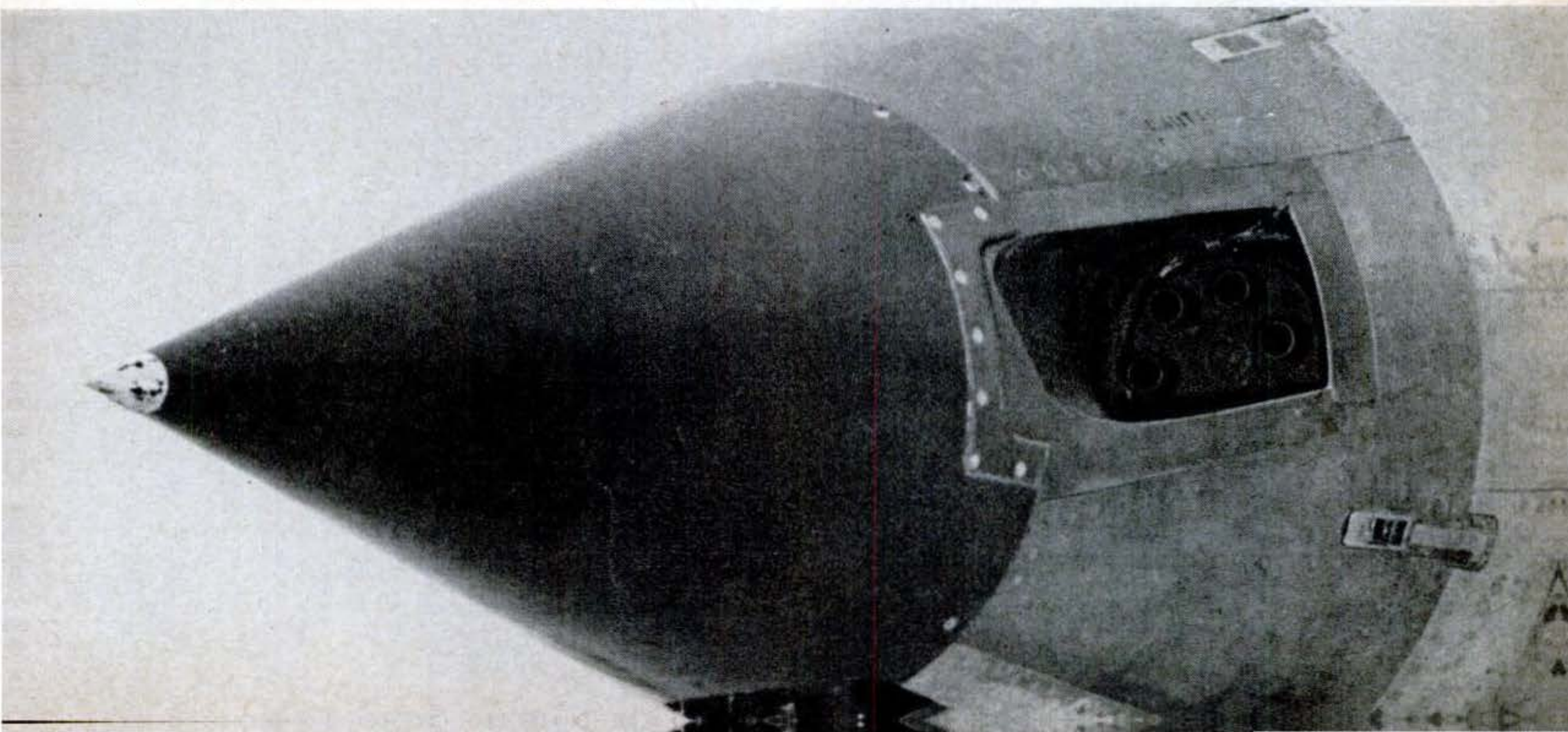
SHARK-FANG AIRSCOOP lets F-105 gulp the breeze without choking or gagging, as it progresses through supersonic shock-wave conditions. Improves speed, altitude, range—naturally.

"ANYWHERE! ANYTIME!" says Don Seaver (shown), boss test pilot for the F-105. "We can work the Chief out of pint-size airports all over the world. She's a short-field bird!"



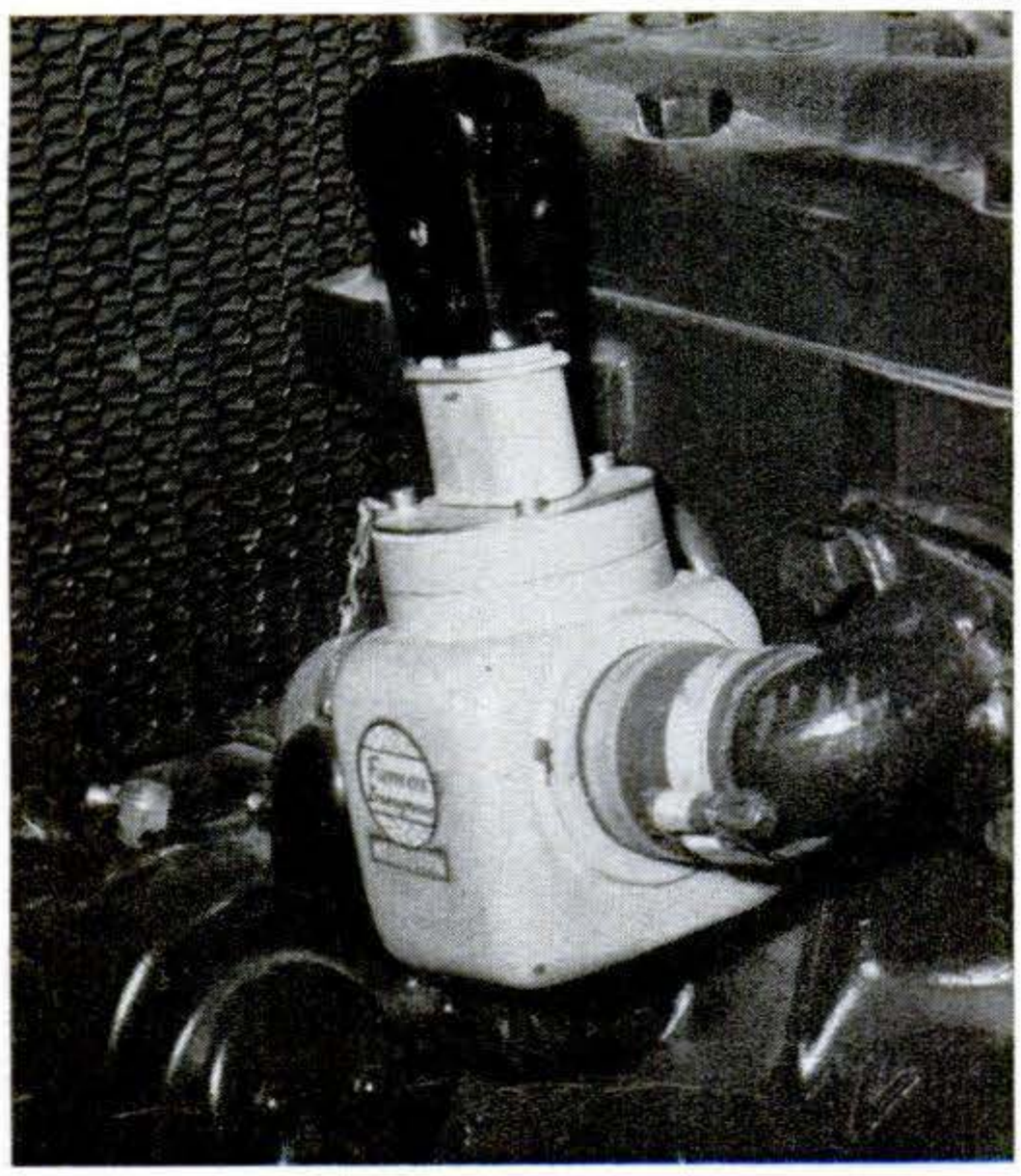
HOLLOW FIN in the tail assembly scoops in a "free hurricane" of air at high-speed flight. The Chief's giant J-75 engine makes good use of it to cool its afterburner shroud.

THIS OMINOUS BLACK HOLE is just as deadly as you might think. When the pilot punches the red button, 7,000 rounds a minute pour from the rotating barrels of the concealed Vulcan. END



What's New Behind the Iron Curtain

Back-seat driving is both possible and practical with this two-place Jawa motorcycle, displayed at the Leipzig Fair with other products shown here. It's a Czechoslovakian slant on our dual-control student autos and gives learners training in traffic. Rear handlebars are linked to the front fork by ball-joint tie rods; brakes, clutch and ignition switch are twinned. If his rider panics, teacher takes over.



Electric water heater assures quick starts for East German motorists in cold weather. The 250-watt immersion unit housed in a watertight container is inserted in the hose between the engine block and the bottom of the radiator and powered from a 115- or 230-volt line. A plug seals the connecting point when it is not in use.

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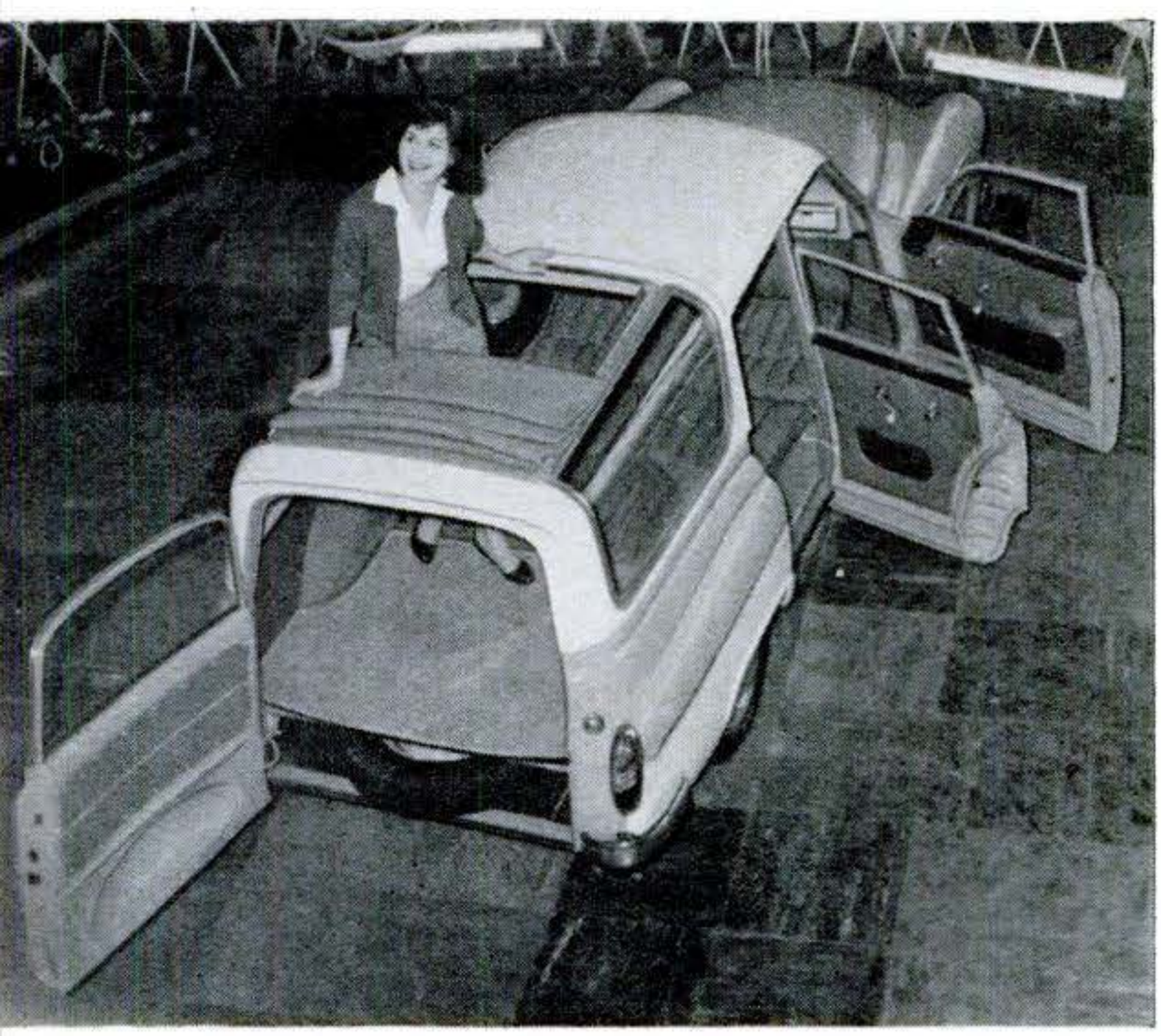
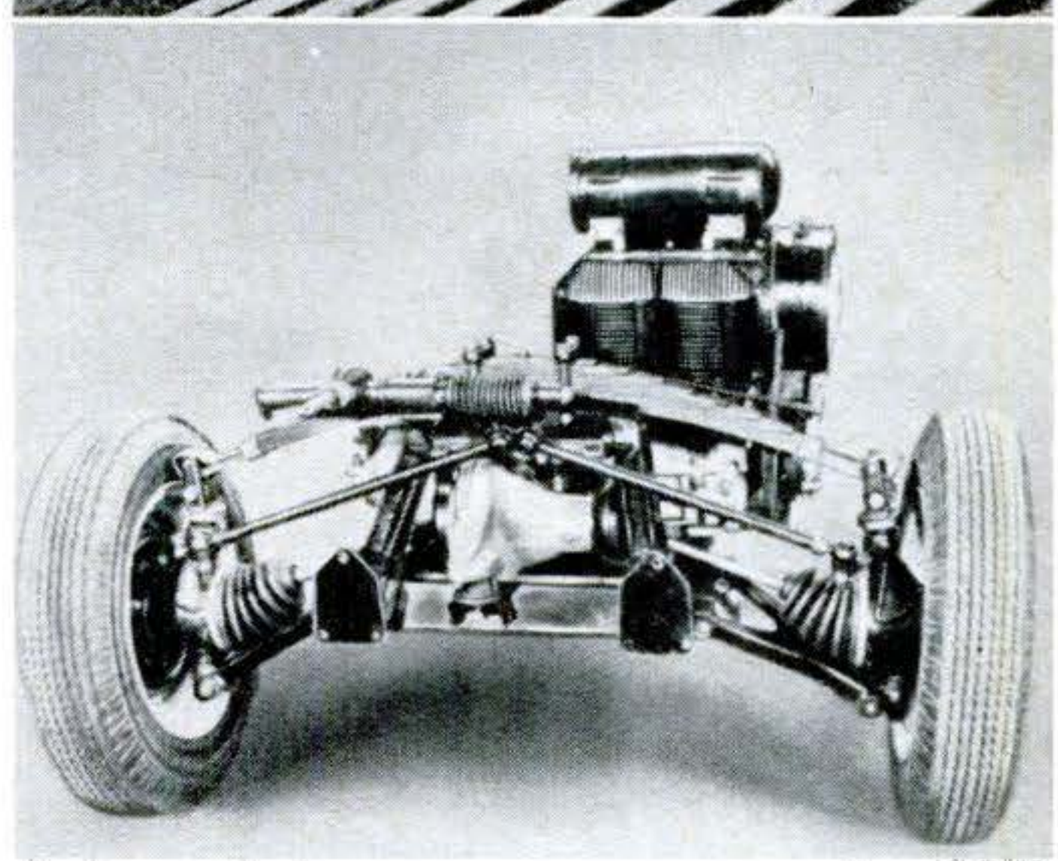


Open-air station wagon has a fabric roof that can be pushed back in folds. A new model added to the three-cylinder East German Wartburg line (PS, June '56), it has a single wide stern door for access to the cargo compartment, and front and rear seats with backs that drop down flat to become a double bed for roadside camping.

Miniature dump truck steers by footpower: The operator turns the wheels by shifting his weight on a pivoted treadle. Other controls are manual. A belt-driving, six-hp. diesel powers the little East German vehicle's three-speed gearbox and pump for a hydraulic lift. The dump body can be tilted forward or to either side by relocating hinge pins at the sides and rear.



New German small car shows off its traction at top. At center is the little P-50 Trabant's front-drive engine and wheel assembly (looking from the driving position). It was removed with gearbox, differential and suspension by taking out a few bolts and lifting off the body. At bottom the 18-hp. engine is in place. Cooled by blower, it sucks air from beneath.

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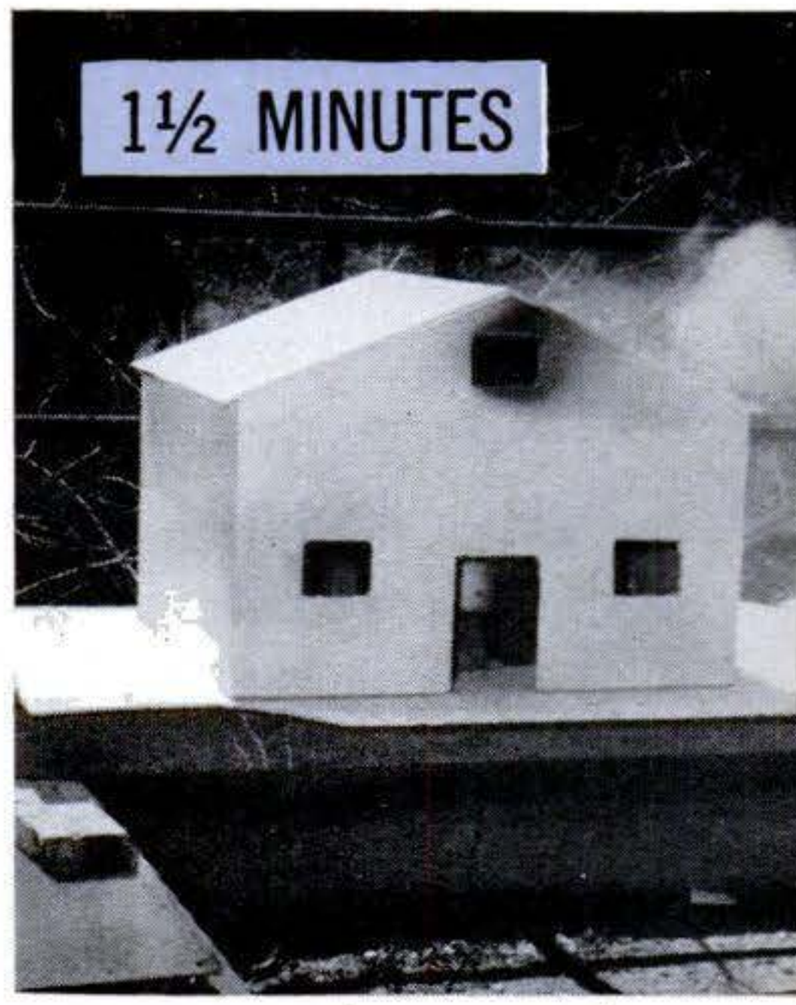
One dollhouse burns down, one doesn't. The difference?



Pots of kerosene-soaked paper kindle simultaneous fires in models . . . One on right is coated

Shifting wind sends flames from model with ordinary paint against the fire-protected model.

Paints That Fight Fire

They decorate a house like any paint—until fire strikes. Then chemical magic slows the flames

ONE of the most attractive ideas to spill out of the test tubes is paint that will slow or even stop fire. Several brands are now on the market, and Du Pont is about to add a new one this month or next. Tank cars of the stuff are being slapped onto factories, hotels, hospitals. You should know about it, too.

The fire danger nags at the back of every homeowner's mind. Even if you're the careful type who keeps his cellar neat and his chimney swept, your home probably rates only a few notches better than a fire trap: wood frame and exterior, maybe some plywood or fiberboard inside, all coated with paint that can spread flame

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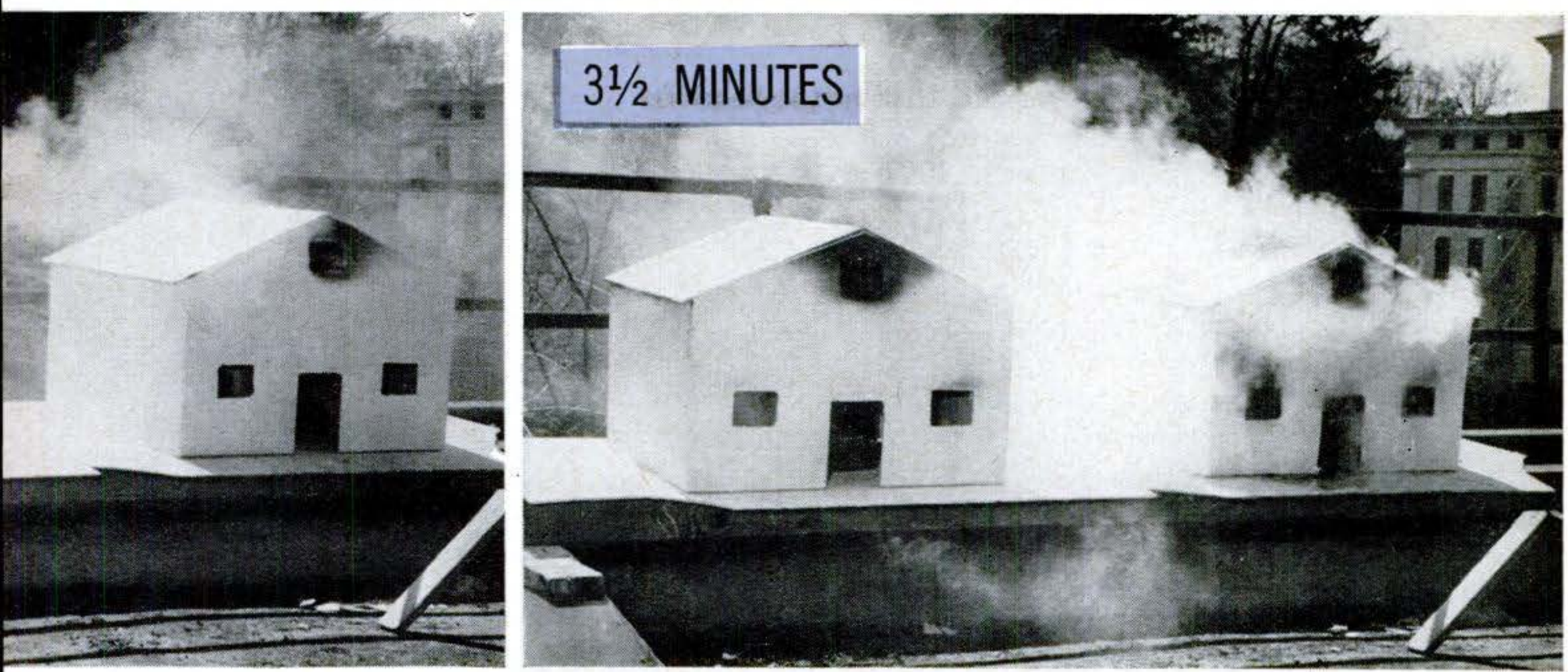
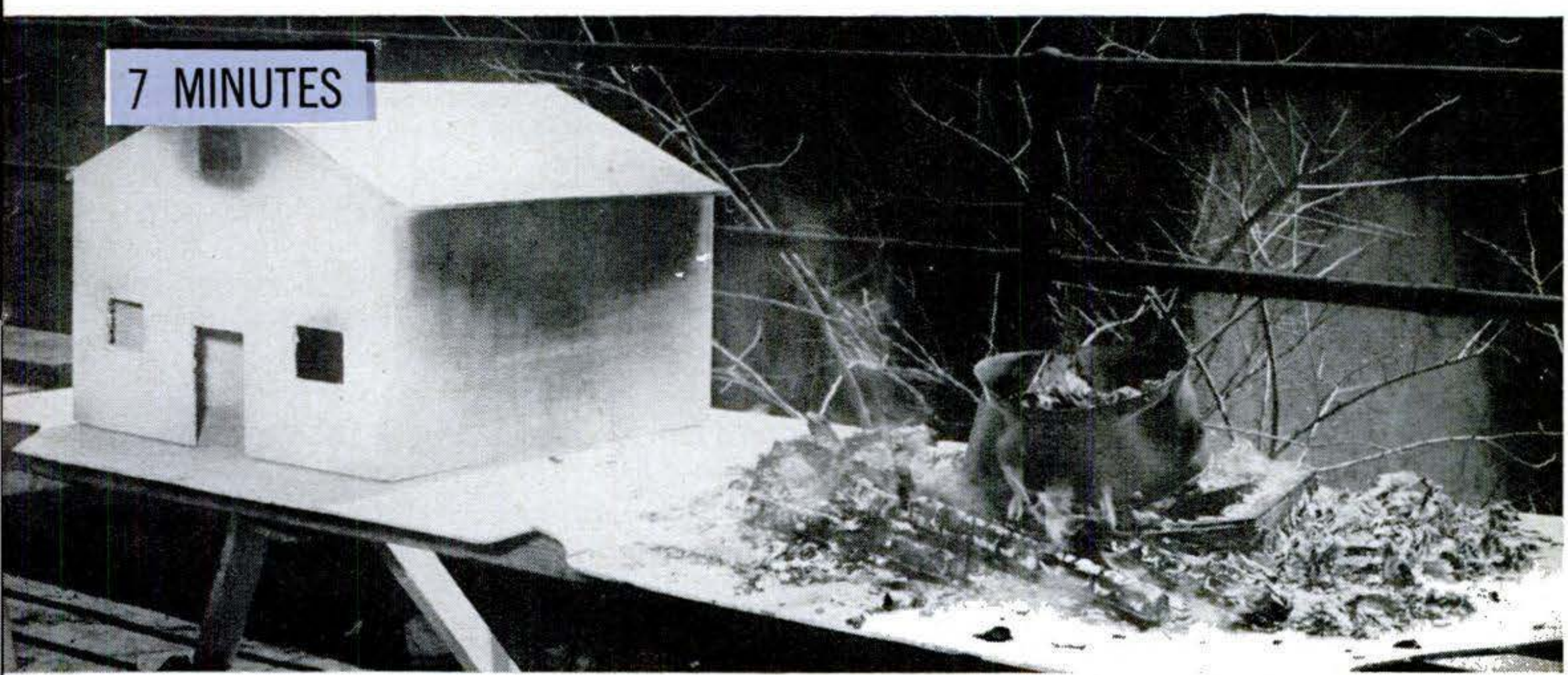
Fire-retarding paint on one, standard paint on the other



with ordinary paint . . . Fire-protective paint (left) blackens but gives off less smoke.



Only ashes remain of model coated with ordinary paint. Other stands, its wood still sound.

when ignited by the tinder furnishings in the rooms. Each year, about 550,000 homes catch fire, at a cost of $285,000,000 and 6,400 lives.

Will fire-protective paint solve the problem? No. Will it help? Yes. Is the protection worth the money and effort? Yes . . . if. The "if" means you've got to decide what to use and where to use it. It is only one of many fire-protection steps you should consider. Because of its cost, it seems most promising for special fire-prone areas: cellar, garage, hallways.

What it does. Paint that truly fire*proofs* your house isn't invented yet. The kind that has been invented slows the spread of fire, by depriving the flames of fuel. A small fire can burn itself out, with little harm done. A big fire still burns your house down, but takes longer.

So you gain extra minutes—nobody really knows how many—to get out of the house, to call the hook-and-ladder boys.

How it works. Two basic types of fire-protective paint are now available. One is simply paint containing a chlorine compound. Chlorine is a time-proved flame suppressor—the ancient Egyptians used it, soaking their roof thatching in sea water to impregnate the straw with sodium chloride.

In the modern paints, chlorine atoms

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are built into the molecules of the paint vehicle. The vehicle is the liquid that hardens into the film covering your wall. Ordinary paint films burn; chlorine-containing paint films do not. In addition, the chlorinated film falls apart chemically when heated by a fire. The chlorine atoms come out as gas, some as elemental chlorine (Cl_2) but mostly as hydrochloric acid gas (HCl). The gas adds fire protection by forming a thin barrier between flame and painted surface. Both Cl_2 and HCl are poisonous, all right, but the quantity generated is too small to cause trouble on that score.

The other type of fire-protective paint —the best-known brand is made by Albi Manufacturing Co., although the Glidden Co. offers a somewhat similar product— is entirely different. Its vehicle contains no chlorine, but other ingredients that provide fire protection by a process that's both chemical and mechanical.

When the Albi chemicals are heated by a fire, they decompose partly into gases (carbon dioxide, nitrogen, ammonia), partly into semi-liquid goo. The gases expand inside the goo so that it bubbles and foams like a toasting marshmallow. The paint puffs out, swelling from a film a few thousandths of an inch thick to a black sponge cake maybe an inch thick. You have seen the same kind of reaction if you ever played with the little pellets called "snakes" on the Fourth of July. The difference is that snakes aren't paint and do burn; this stuff is paint and doesn't burn.

The spongy, gas-filled puff is like a foamed plastic, a pretty good insulator. So it helps keep fire heat away from wood underneath the paint, besides slowing the spread of flame along the surface.

How good are they? This is really two questions: How much fire protection do you get? And how good a paint—as compared with ordinary paints—do you get? First—fire protection.

Actually, nobody knows the answer to this one. No two houses are alike, and no two fires are alike.

There are many laboratory tests and demonstrations, but none of them relates directly to what you want to know about: a fire in your house. The best lab test is probably one devised by Underwriters Laboratories, the non-profit, impartial-as-the-United-States-Supreme-Court outfit that safety-checks everything from refrigerators to roofing.

The UL ratings. In Chicago, UL has a "fire tunnel"—a sort of horizontal chimney—big enough to take a 20-inch-by-25-foot test sample. The sample is a tongue-and-groove Douglas fir panel, painted according to the directions on the can and fastened to the removable top side of the tunnel.

The test idea is simple. The engineers light gas jets at one end of the tunnel, then time the spread of flame along the surface of the test panel. For a comparison standard, they run the same test on an unpainted panel of red oak.

On the untreated oak panel, flames will cover the full 25-foot length in 4½ minutes. If flame takes nine minutes to cover a painted fir panel, the paint slows flame spread to 50 percent and it gets a UL rating of 50. The rating indicates speed of flame spread; the *lower* it is the more fire protection you get.

How they compare. Albi comes out way ahead in the UL test, with ratings that range from 20 to 45 (depending on the thickness of the paint film). All the others score between 40 and 70 (see chart on page 73).

The UL figure alone is no magic number. You've got to read the fine print on the label. Some paints achieve their UL listing only when applied very heavily in several coats. This means added expense and labor. And at least one manufacturer advertises coverage more than four times greater than that listed by UL.

Is it paint? Besides fire protection, you want a decorative covering that is easy to apply and to keep clean. Only on washability do the fire-protective paints fall down, and there not badly.

These paints are flat enamels. They use synthetic-rubber or alkyd resins. All contain petroleum solvents. (This means that they are definitely inflammable while liquid, like ordinary paints, and do not gain peak flame resistance until thoroughly dry.)

You have to thin them a little, but then you can brush, spray or roller-coat them in the ordinary way. They must be applied heavily, though; with some, a gallon

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covers only 100 square feet. A fair variety of colors (including clear) is available factory-mixed, and you can make most other shades with standard pigments.

Washability. Albi's original product was a rough, calcimine-like coating that could hardly be washed at all. The chlorine-containing paints have been harassed by a reluctance to dry completely: They stayed slightly sticky, easy to dirty and difficult to clean.

Today things are better, although no manufacturer claims washability equal to that of a high-grade gloss enamel.

Du Pont feels it has this problem licked. It calls its new product the first real "architectural" paint offering fire resistance, says that it is definitely superior in appearance, toughness and washability.

Comparison tests have been published on Albi's current product (Type 99). York Research (a highly regarded independent laboratory retained by Albi) rated this paint fair on washability (poor in the case of ink stains). That's pretty close to most standard enamels, but two or three notches below the very best. On other characteristics (brushing, leveling, lapping, flexibility, chip resistance), York found Albi-99 equal to or better than the best standard enamels. Hiding power is only fair, but that's on purpose—to make sure you apply the paint thick enough for fire protection.

Is it worth while? Fire-protective paints cost $7.50 to $9 a gallon—50 percent more than high-grade interior finishes—and a gallon doesn't go far. They are available nationwide, but mostly from big paint- or building-supply houses that cater to the industrial and commercial trade.

The manufacturers would love to see homeowners slap the stuff all over every-

[*Continued on page 208*]

Fire-Protective Paints

HOW THEY RATE

The chart below gives flame-spread ratings (the lower the figure the better the fire protection) as determined by Underwriters Laboratories. It includes only those paints listed by UL. Other brands are available and may be equally effective.

BRAND	MANUFACTURER	PRICE (1 gal.)	TYPE OF SURFACE	UL RATING	AREA COVERED BY 1 GAL.[a]	COST PER SQ. FT.[a]
Albi-99	Albi Mfg. Co. Rockville, Conn	$9	unprimed Douglas fir	20-25	100 sq. ft. in 2 coats	9¢
			primed Douglas fir	30-35	100 sq. ft. in 2 coats	9¢
			primed or unprimed Douglas fir	35-45	200-250 sq. ft. in 1 coat	3.6-4.5¢
			cellulose fiberboard[b]	35-45	175 sq. ft. in 1 coat	5.1¢
Dupont Fire Retardant Enamel	Dupont Co. Wilmington, Del.	$9	Douglas fir	50-70	100 sq. ft. in 3 coats	9¢
Firehold	Cheesman-Elliott Co. 639 Kent Ave. Brooklyn 11, N. Y.	$7.50	Douglas fir	40-50	87.5 sq. ft. in 2 coats	8.6¢
Duo-Tex[c]	Glidden Co. Cleveland 14	$7.80	Douglas fir	50-60	70 sq. ft. in 3 coats	11¢
			cellulose fiberboard[b]	40-60	125 sq. ft. in 2 coats	6.2¢
Fyr-Kote	Morris Paint & Varnish Co. St. Louis 3	$7.90	cellulose fiberboard[b]	40-60	100 sq. ft. in 2 coats	7.9¢

[a]Coverage required to give UL flame-spread rating
[b]½-inch-thick fiberboard, with starch-type factory finish, attached to solid noncombustible surface
[c]Same product is sold under Celotex brand name by Celotex Corp., Chicago 13

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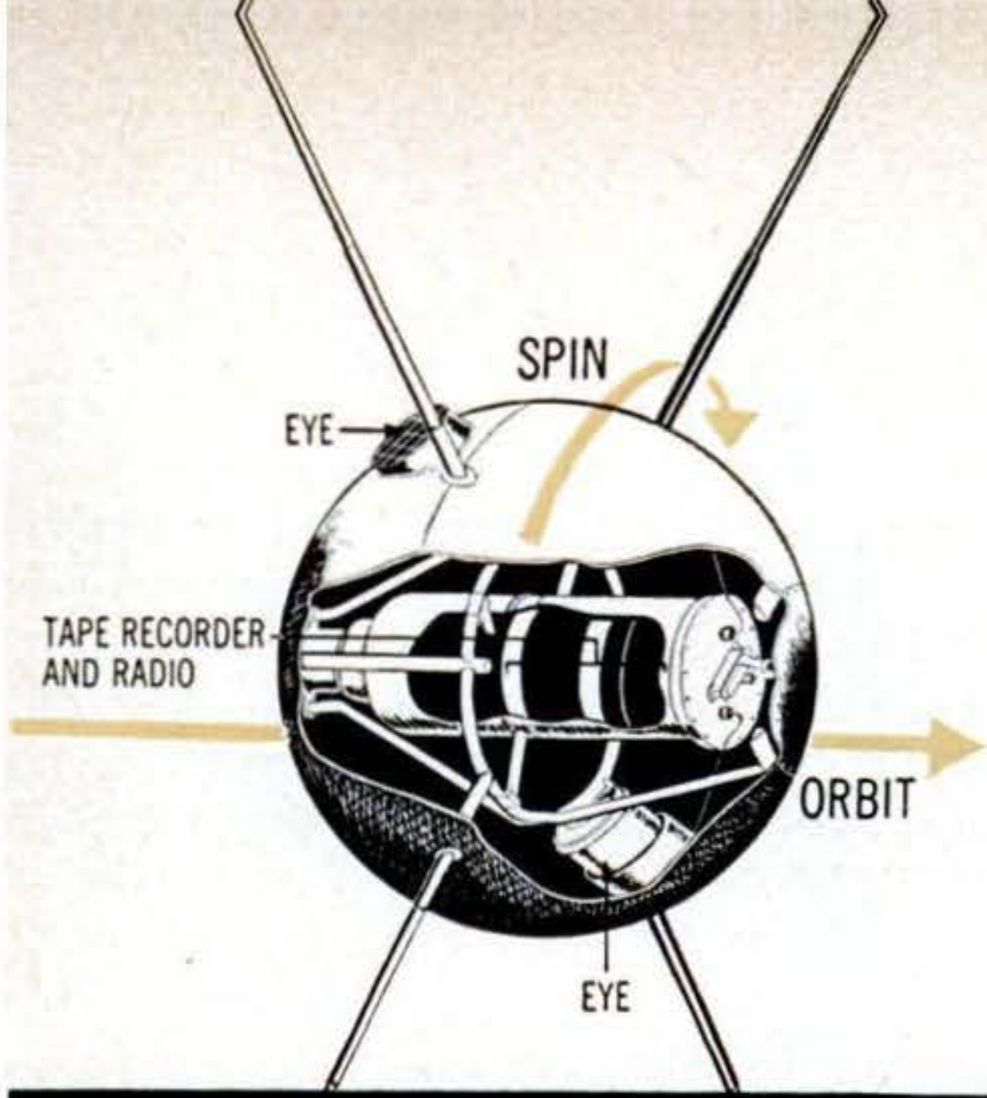

Inside Our

GIVING weather men a world-wide view of hurricanes, typhoons and bigger-scale cloud formations, from an observation post some 200 to 1,500 miles high—that's the job of our first earth satellite that sees.

Due for launching by the time this is read or soon after, in an orbit crisscrossing the equator like those of earlier U.S.

WEATHERBIRD'S EQUIPMENT is put in half of its magnesium sphere at Army Signal Engineering Laboratories. Eyes view earth through two windows, one pointing downward in foreground, other to be opposite. Drawing at top of page shows finished moon's appearance and motions.

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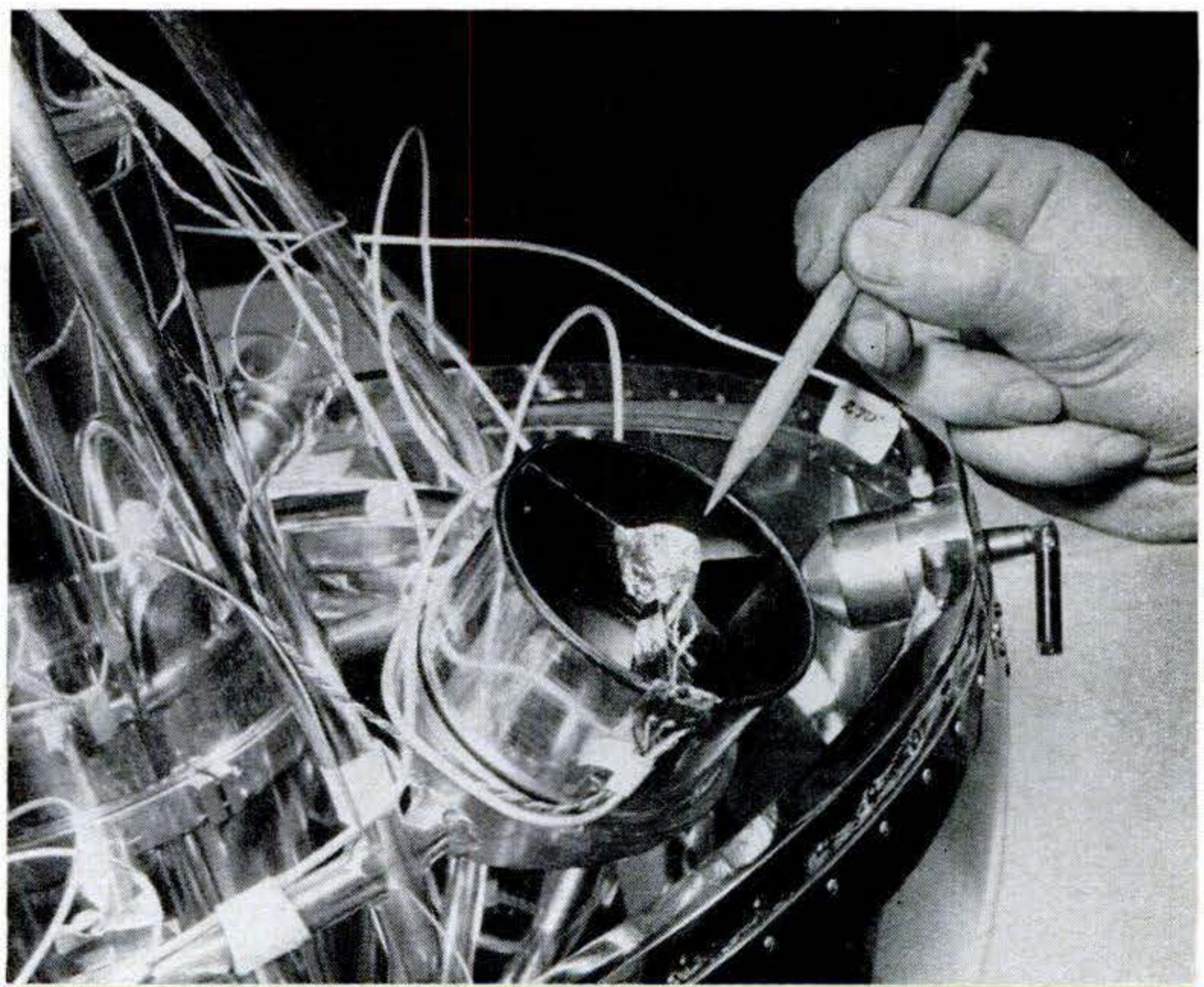
Weatherbird Satellite

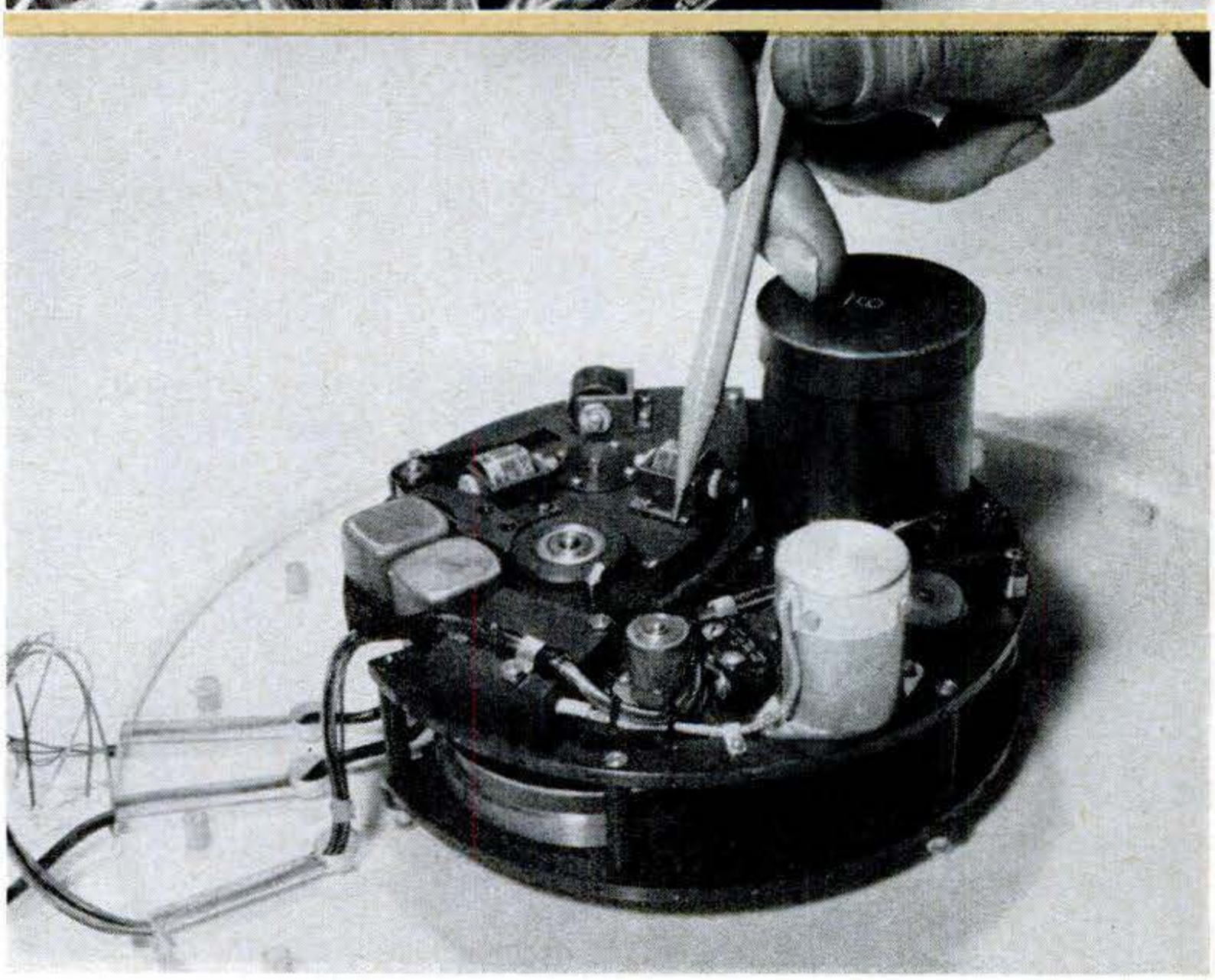
moons, the two-eyed orb—No. 2 of our full-size 20-inch Vanguard type—is officially called the "cloud cover satellite." It has been nicknamed the Weatherbird by its designers at the Army Signal Engineering Laboratories, Fort Monmouth, N. J. During its batteries' life of about two weeks, they predicted, it would permit the most accurate weather forecasts ever made—for clouds are the telltale signs of great air movements that make the weather.

A pioneering kind of television satellite, the Weatherbird itself serves as a TV camera—taking advantage of its own motions to scan the earth in TV style.

A photocell in each telescopic eye, which has a narrow one-degree field of



MOON'S EYE sees small area of earth at a time and focuses its reflected light, with three-inch parabolic mirror, on photocell to which pencil points. By infrared light, for best contrast, cell registers area's overall brightness: clouds, as white; land, gray; sea, black. As moon spins, and advances in orbit, eye's successive TV-style sweeps build up a complete picture of cloud pattern over a large part of world.



TAPE RECORDER in moon puts pictures on 75-foot magnetic tape (indicated). On radio command it plays them back over transmitter, and receiving station obtains duplicate tape, for subsequent filming. Depending on moon's inclination to surface of earth, one eye gets better view than other, and its independently recorded picture is the one selected for final transcription to film.

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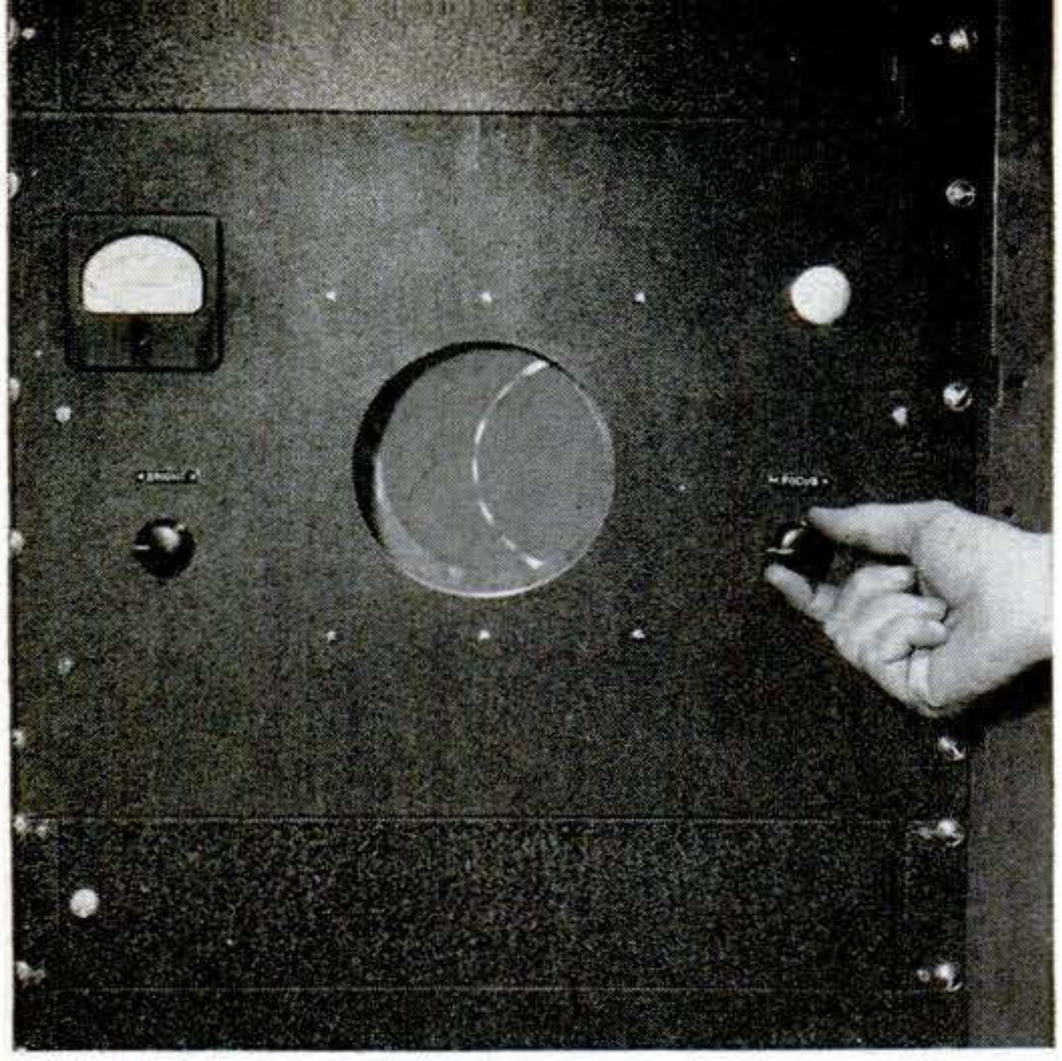

TO REPRODUCE PICTURE from final tape, oscilloscope screen displays one "sweep" at a time as luminous trace, simulated here by drawn-in one. Camera (not shown) records successive traces on moving film and thus assembles them, side by side, into a photo of earth's clouds.

view, peers at a small area of the earth and gauges its brightness. Meanwhile the moon spins, once a second, sweeping the eye over a curved strip of the earth. The eye scans adjacent strips (with a slight overlap) as the moon orbits—building up a TV picture that is taped, radioed to earth, taped again, and finally transcribed to film for viewing.

What results from each orbit is a photograph of a vast belt of cloud-spotted earth, roughly 12,500 miles long—the world's sunlit half—and up to some 2,500 miles wide at the maximum range of good seeing. Successive orbits picture most of the world. Under ideal conditions, Weatherbird's eyes are sharp enough to distinguish a natural feature only six miles square, smaller than the islands of Nantucket, St. Helena, or Saipan.

FOR TRIALS, tiny working model of two-eyed moon spins and orbits around globe painted with land, sea and clouds, and realistically illuminated from inside with moving day-and-night effects. Moon, on arm, is just above hurricane being pointed out on globe. END

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Plain Talk About Space Flight

By Lee A. DuBridge
President, California Institute of Technology

"Are we going to be led into wild Buck Rogers stunts and insane pseudo-military expeditions?" The question was put to the Western Space Age Conference recently by a distinguished American physicist, Dr. Lee DuBridge. His own answer, condensed below, may bring more than one starry-eyed spaceman back to earth.

FOR most scientific explorations in space the presence of man involves unwarranted complications and expense. True, a man makes a pretty good servo system—he could keep a telescope pointed at the right star, for instance. He could supply a little bit of energy—by turning a crank connected with a dynamo to charge up a battery, possibly.

But in return he demands a colossal price.

He not only requires air, water and food to keep him alive and comfortable, but also fantastically expensive provisions to bring him back alive. No instruments demand such a ridiculously expensive luxury. They are content to coast around in space unattended for years and come back to earth, if at all, in a fiery cataclysm. But not man! He wants to get back to earth unburnt and essentially unjarred.

We are a long way from having the faintest idea of how to do it in any practical way. Consider a satellite large enough to carry a man, and the man now wants to return to earth. Obviously, jumping out with a parachute and an oxygen tank won't do it. Our man would become another satellite floating alive around the earth at 18,000 miles per hour—alive, that is, until his oxygen gave out.

No, he'd better stay in his vehicle.

He will then need a sizable rocket motor and a good deal of unused fuel so he can reduce his speed and lower himself gently into the atmosphere—where his parachute may be used. That will require a very large amount of propellant. Right away we see that the initial payload will have to be not a few hundred pounds, but many thousand pounds.

Men can certainly some day be projected into orbits around the earth, eventually into orbits which go far from the earth. There is nothing about space travel which man can't stand—except perhaps the expense. Provided he is housed in a suitable container supplied with oxygen, water, food and suitable temperature controls, there is nothing in space that will hurt him. On long journeys he is more likely to die of boredom than anything else.

When we talk about landing a man on the moon or Mars or some other planet, however, and then getting him off again and back home safely, we are talking about a new order of magnitude of difficulty and cost. To land safely on the moon will take the same sort of equipment needed to lower him back to earth. Gravity on the moon is less, and that will help—but also there is no atmosphere to support a parachute. The entire vehicle will have to be lowered gently to the moon's surface using rocket blast alone.

Then you will need enough fuel to take off again, get projected into an earth-bound orbit, and have enough fuel to lower him gently into the earth's atmosphere. The round trip in the best orbits would take not less than 10 days. I will leave it to some rocket experts to calculate what payload would have to be lifted from the earth—and how many millions of pounds of initial thrust it would take.

Nothing impossible about it. It will just take a lot of money and a long time.

Whether it is worth it or not depends on our concept of the values to be achieved. What are these values?

A man landing on the moon and coming back could bring back valuable scientific

[*Continued on page 240*]

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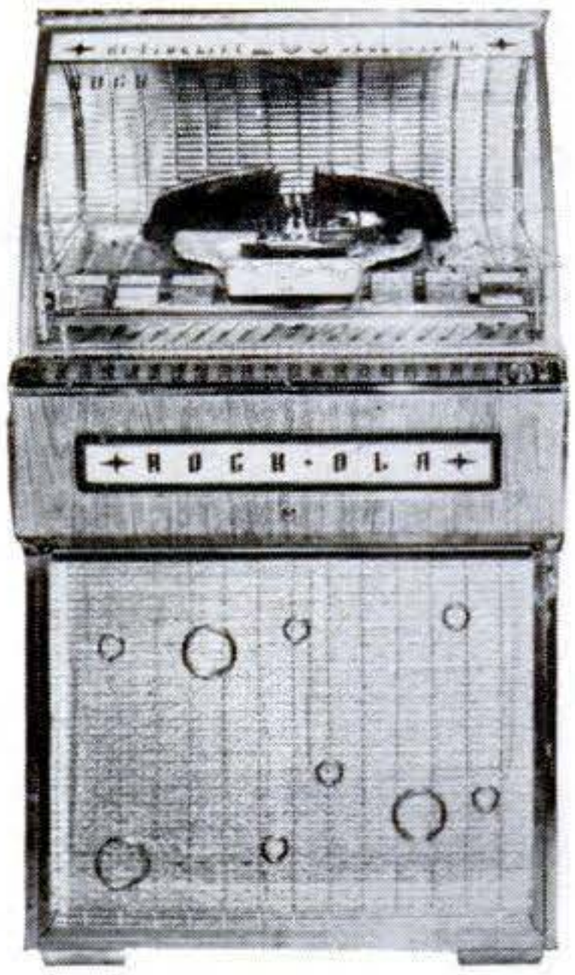
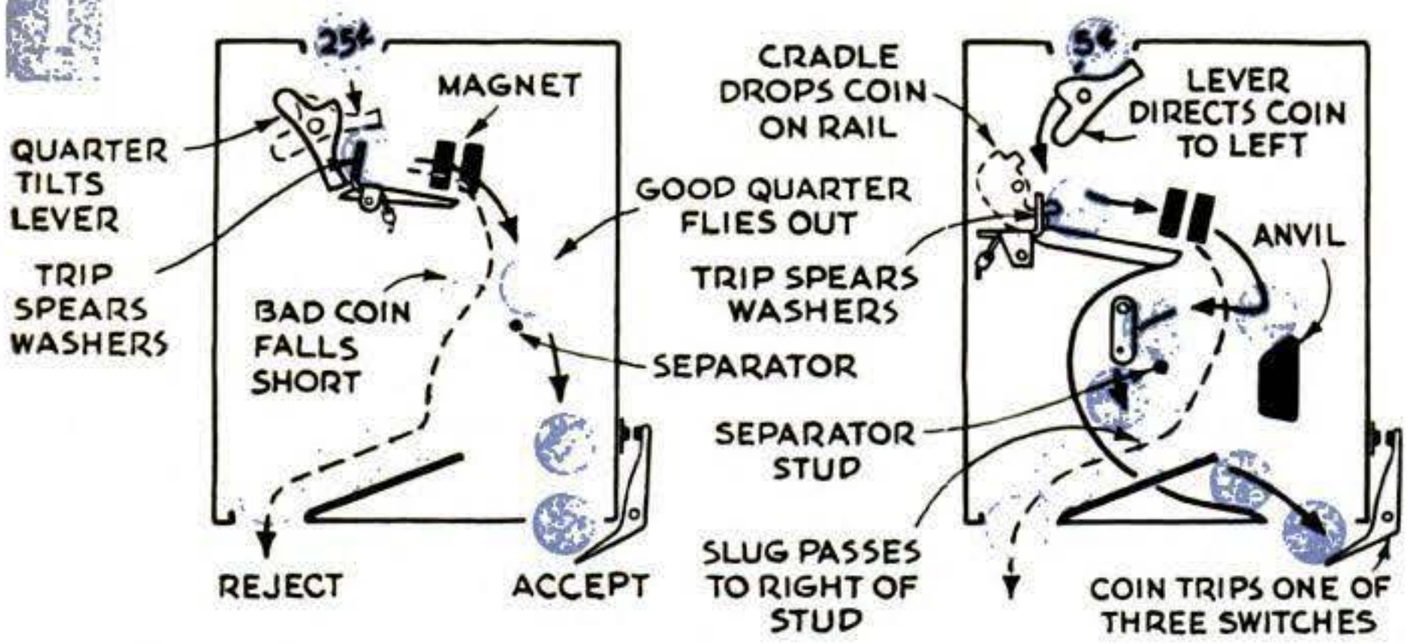
Here, in five easy stages, is what happens when you drop a dime into a coin phonograph to hear your favorite hit tune

How a Mechanical Disc Jockey Works

By Phil McCafferty



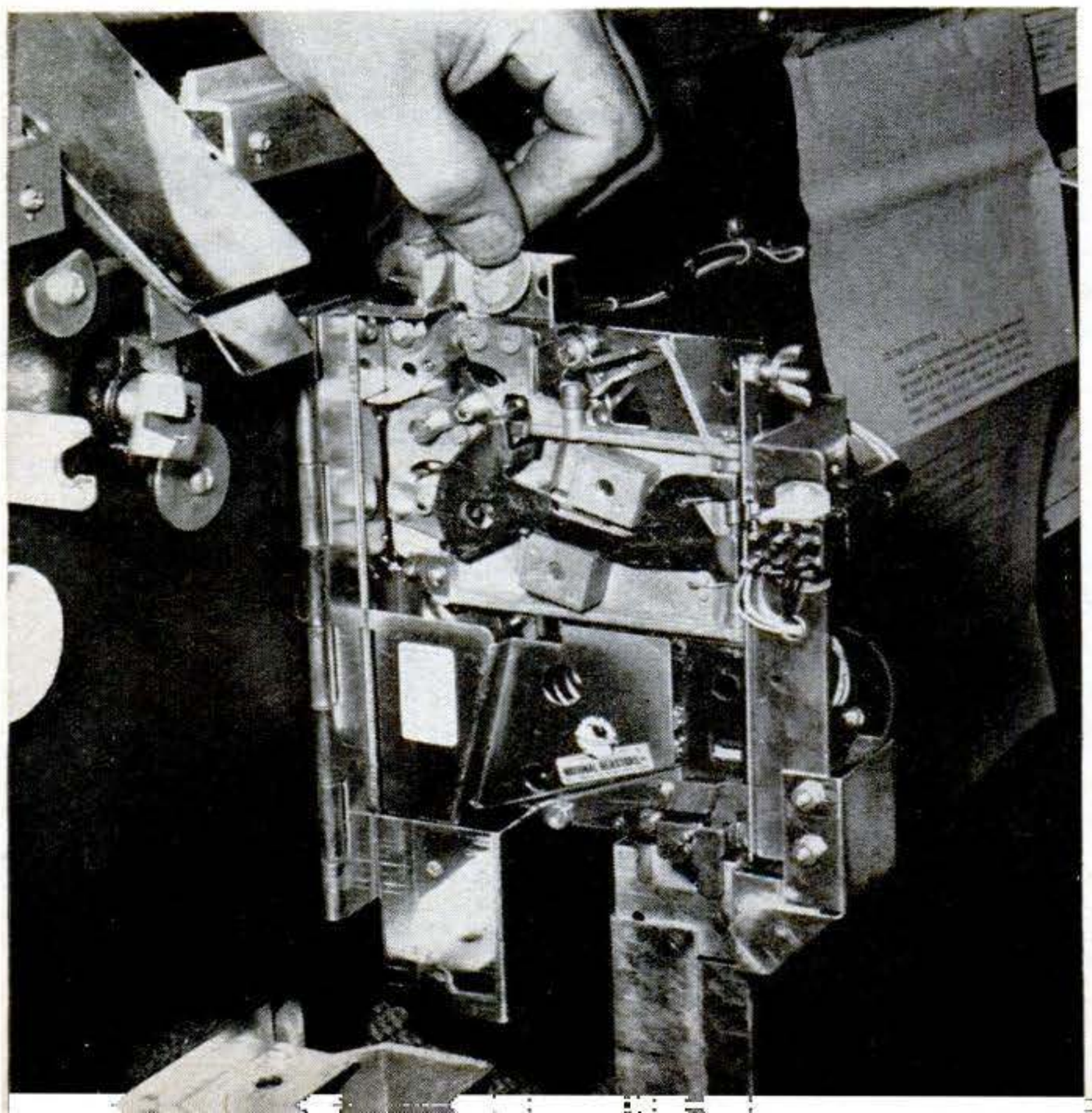
1 *First it takes your money and makes sure it's good*



AUTOMATIC CASHIER has a sharp sense for bogus coins. All enter same slot. A quarter's weight tilts lever that routes it as at the far left. Lighter nickels and dimes fall as shown in second drawing.

Each rolls past permanent magnets that have little effect on genuine coins. But lead, zinc, copper or brass slugs are slowed by effect of eddy currents induced in them. Good quarter strikes separator so as to fall into ACCEPT channel. A slug, being slowed up, falls on the wrong side, into the REJECT channel.

Fast-moving nickel or dime bounds off anvil over the separator stud. Bogus ones fall short of the anvil or fail to bounce far enough.



THE COIN BOX also rejects any bent, nicked, under- or oversized coins, which stick in sizing channels. Washers are speared by hinged trips.

Such rejects are released when return lever is pressed, clearing channels for good ones. Accepted coins trip one of three switches at the bottom of the box, crediting the customer with one, two or five plays as he feeds the slot.

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THE mechanical show inside a modern coin phonograph is itself worth what you pay to hear a record. Miracles of automation, these machines make sure the coins they take are good, count and credit you for them, memorize the selections you pick as fast as you can punch buttons, spin regular and extended-play discs mixed, and charge the customer accordingly.

A mechanical cashier gauges the size, condition, alloy, hardness and elasticity of each coin as it falls down the chute. One off-beat specification and back it goes to the customer.

The record mechanism selects one of the 100 seven-inch, 45 r.p.m. discs in the library, puts it on proper side up, shows what's being played, and puts the record back. A counter rings up each sale and keeps a running tab of most-chosen selections.

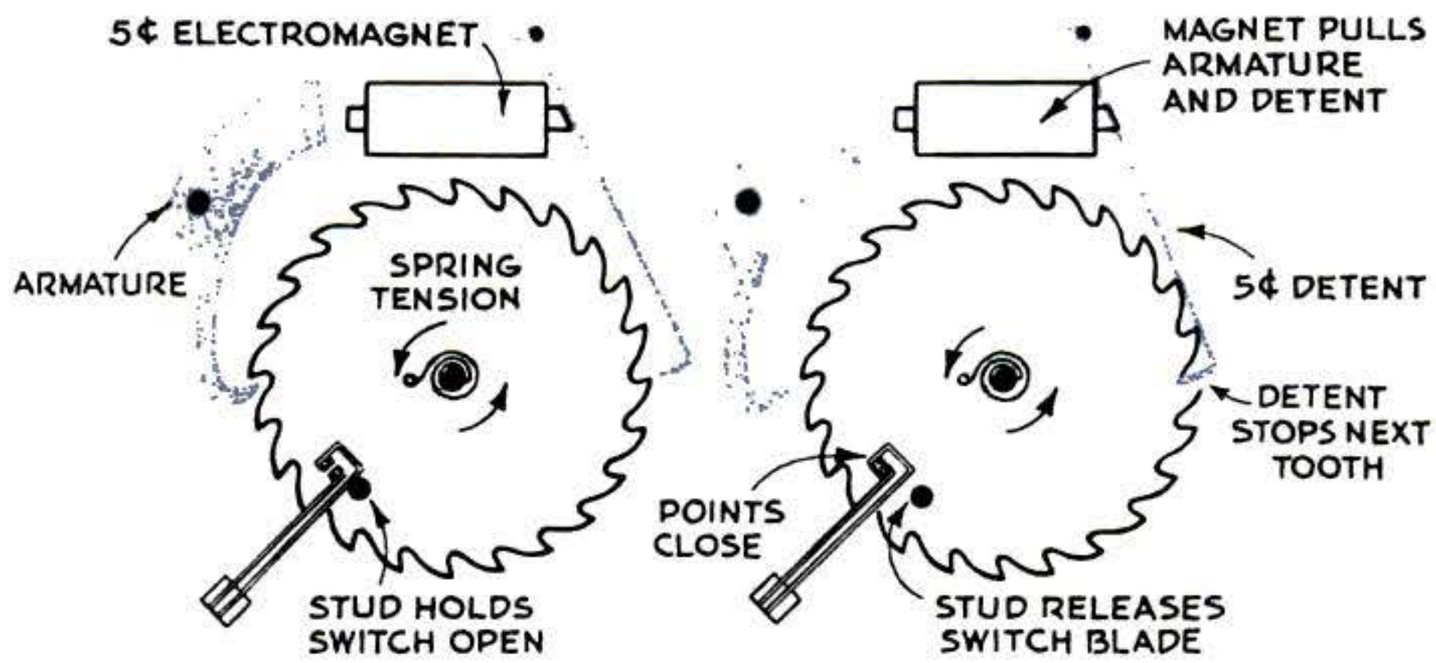
What's inside? Two of four makes store 100 records in upright circular holders, called "ferris wheels." Wurlitzer uses a similar horizontal wheel or "carousel." The wheels rotate to bring the selected record to the turntable.

Seeburg stores its 100 records like books on a shelf. The turntable travels to the record, slides it onto a horizontal spindle, plays it vertically.

All work the same in that the credit accumulator lets you make selections up to the amount of cash you've put in. Your selections are memorized by the displacement of pins or levers or the reversal of magnetic flux in tiny ring magnets. Traveling scanners stop at the displaced pins, or read a reversed current from the altered magnets, corresponding to the records chosen.

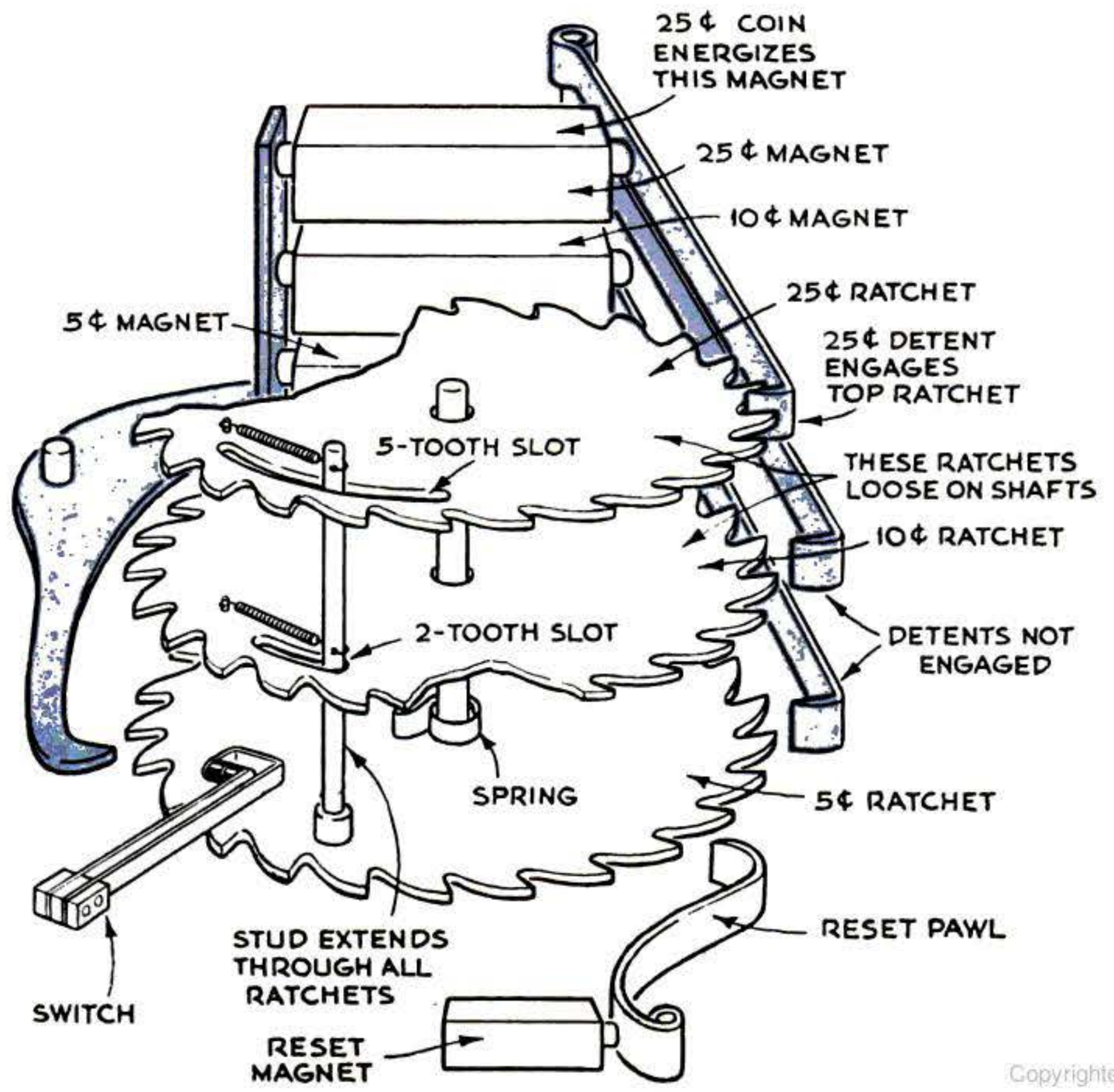
A special "dual credit" accumulator even gives you a choice of playing regular

Next it counts the cash and gives you credit in trade



COIN-OPERATED SWITCH briefly energizes an electromagnet. This draws a pawl out of a ratchet wheel, which is under spring tension and so turns.

But the magnet also pulls a detent (right) that catches the wheel just one tooth around. Meanwhile, a stud on the wheel has drawn away from a spring switch, letting it close. This permits you to make and play one selection.



THE CREDIT UNIT actually has three ratchets. The switches closed by dimes and quarters energize different magnets. All release the same escapement from the five-cent disk but pull in separate detents.

If, as shown, the 25-cent magnet is energized, its detent stops the top disk. The stud in the bottom ratchet moves in a slot in the top one, which stops it only when it is five teeth away from the play switch, so accumulating five play credits.

The 10-cent disk slips the stud two teeth. As you make a selection, a reset magnet jerks the bottom disk back a tooth, canceling a credit. Unit can store 26 credits.

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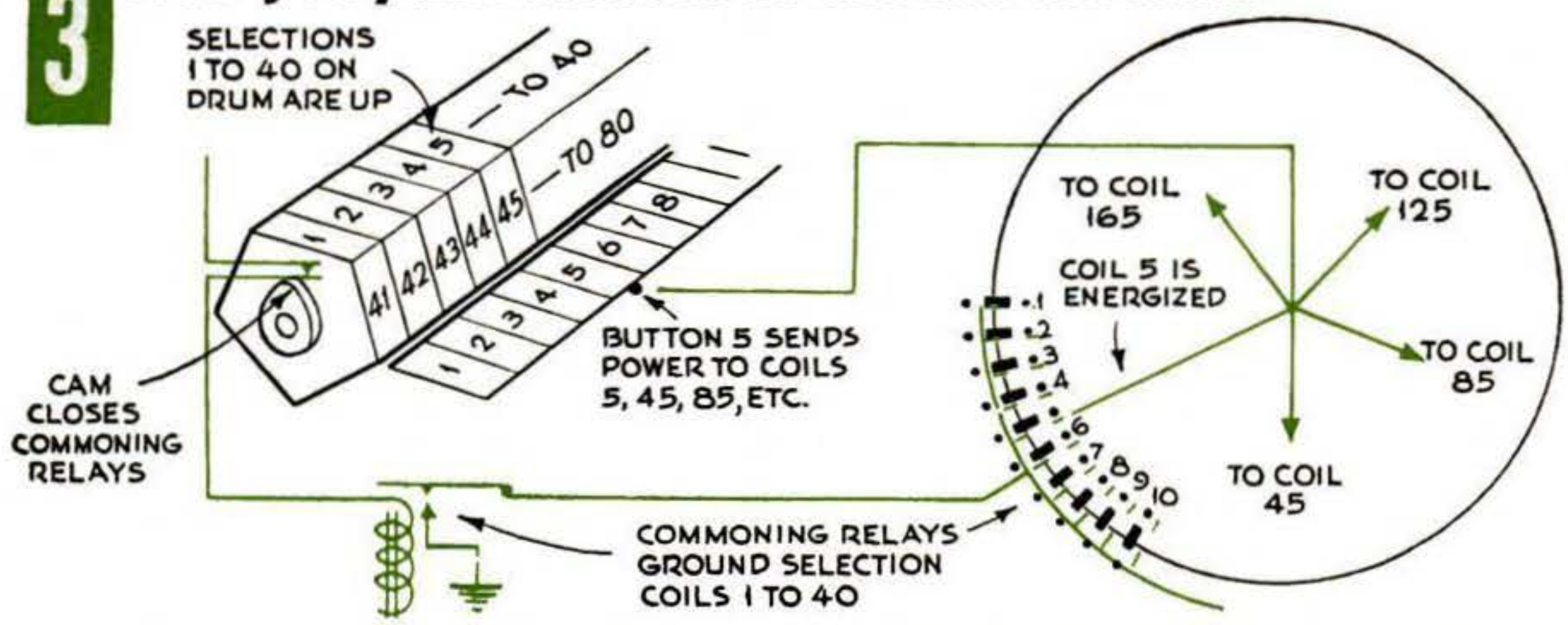
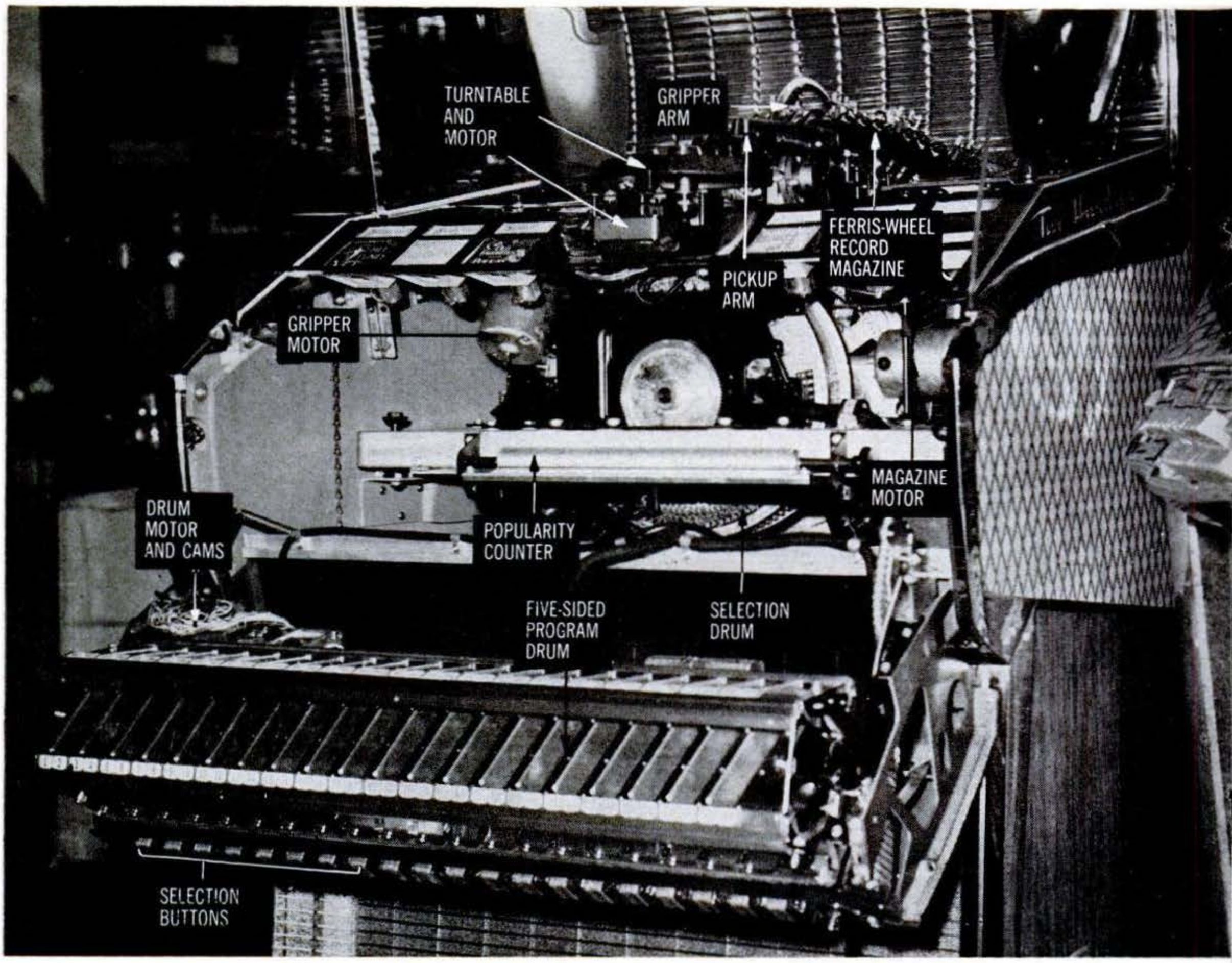
3 Now you push buttons to choose the music



A FIVE-SIDED DRUM on the Rock-Ola lists 40 selections on each side. As you turn to the musical lineup that you wish to choose from, cams on the drum shaft energize two of 10 commoning relays (for simplicity only one of the two is shown) which ground (connect to one side of the power line) 40 coils of 200 around a circular selection drum (in photo at right).

These 40 coils correspond to the selections named on the program side turned up. When you push the button for the one desired, No. 5 for example, current is sent to coils 5, 45, 85, 125 and 165. But only No. 5 is among the 40 grounded by the commoning relay, so it alone is energized.



WITH ITS HOOD UP, a Rock-Ola coin phonograph looks like this. It plays platters through a sapphire needle, a ceramic cartridge, and a 20-watt amplifier. The speaker system in its base consists of a high-frequency horn and two 12-inch woofers.

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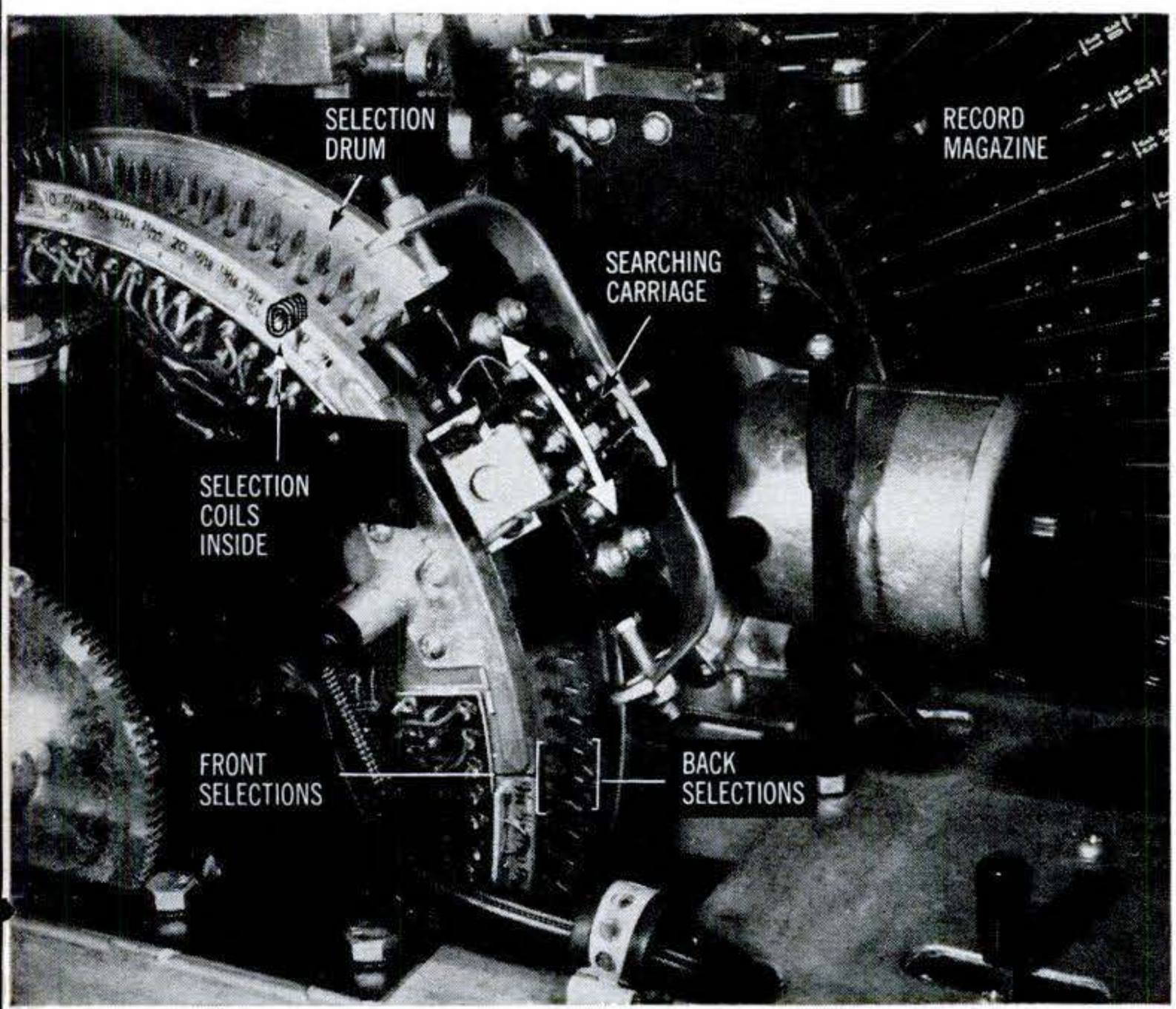


4 As the record wheel turns, a robot hunts for your selections

THE COIL PULLS ASIDE one lever on the selection drum. Then the record magazine turns, and with it a searching carriage rides around the two rows of levers on the drum. When going counterclockwise, the carriage stops at any displaced lever corresponding to a front record side, plays that, resets the lever and goes on "looking" for the next.

All front sides chosen having been played, the carriage hits a reversing switch at the end of its swing, and returns clockwise to search the back row of levers. If stopped by a displaced one, it will now play the "flip" side or underside of the chosen record.

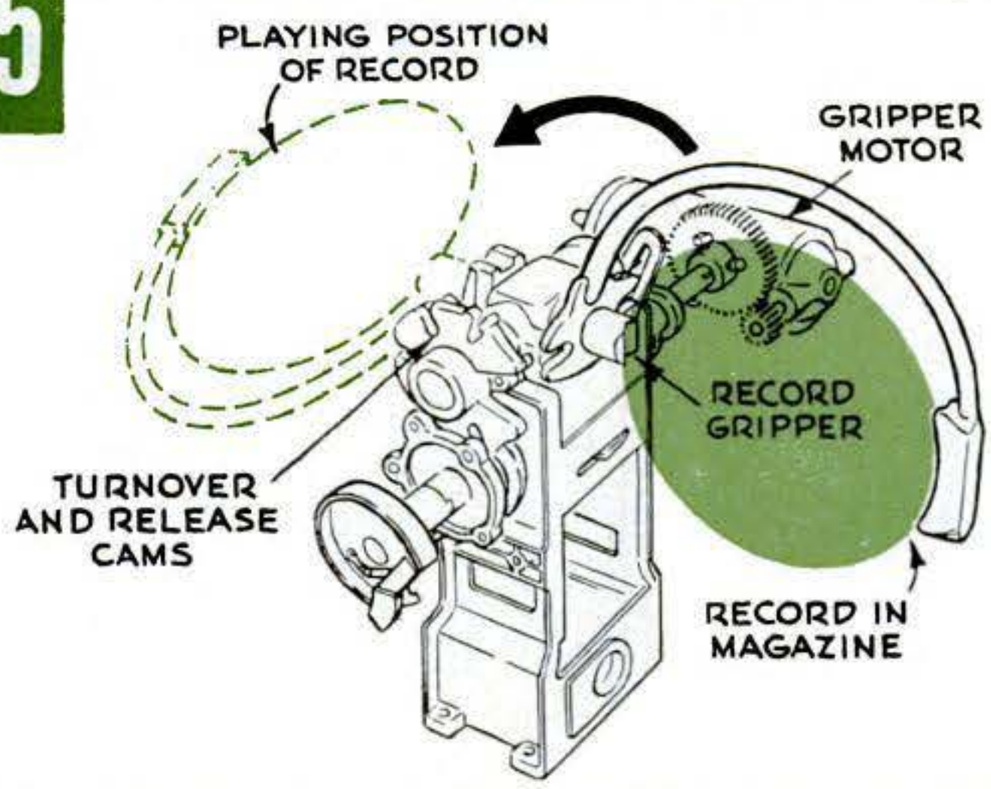
records at 10 cents a side or extended plays for 15 cents, sometimes offering a bargain of three regulars or two EPs for a quarter.

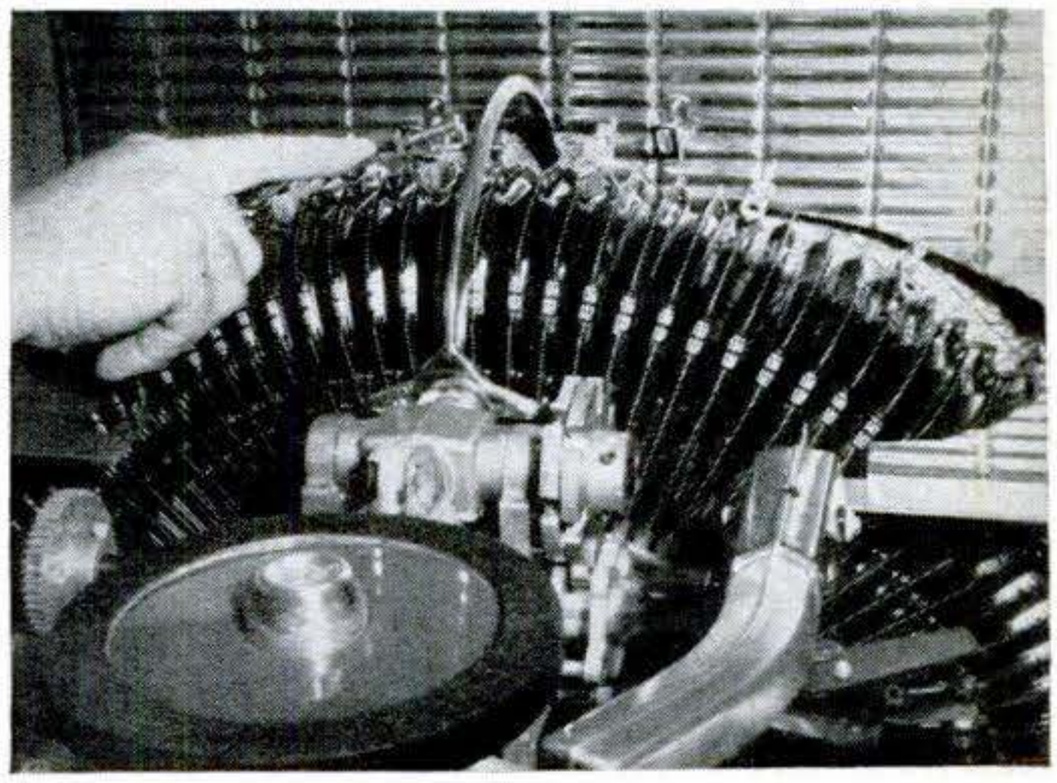
The dingus is adaptable, too: In case of need it can be set to a new price scale or even different combination prices.

For a close-up look at the operation of a typical pushbutton disc jockey, watch a coin fall into the cash box and see what happens afterward in a Rock-Ola. The pictures on these and the preceding two pages show five steps that occur between the cash drop and the first strains of music.

Turn the page for the Seeburg, with its shelf record library and magnetic memory, and for the wall coin boxes that play platters from counters and booths by remote control.

5 A twist of a mechanical wrist puts on the platter





THE FERRIS WHEEL STOPS with the selected record at the top, under the gripper arm. The arm tucks the record securely into a notch, then swings over, deftly turning up the front or the "flip" side of the record as called for, and drops it onto the turntable. The action also starts the turntable, lowers the pickup arm and orders a solenoid in the searching carriage to reset the selection lever that stopped it.

On the counterclockwise search, a pin in the gripper-reversing cam engages a slot that turns the arm to play front record sides. On clockwise search, an opposite cam pin is engaged that turns the gripper arm the other way, dropping "flip" sides up.

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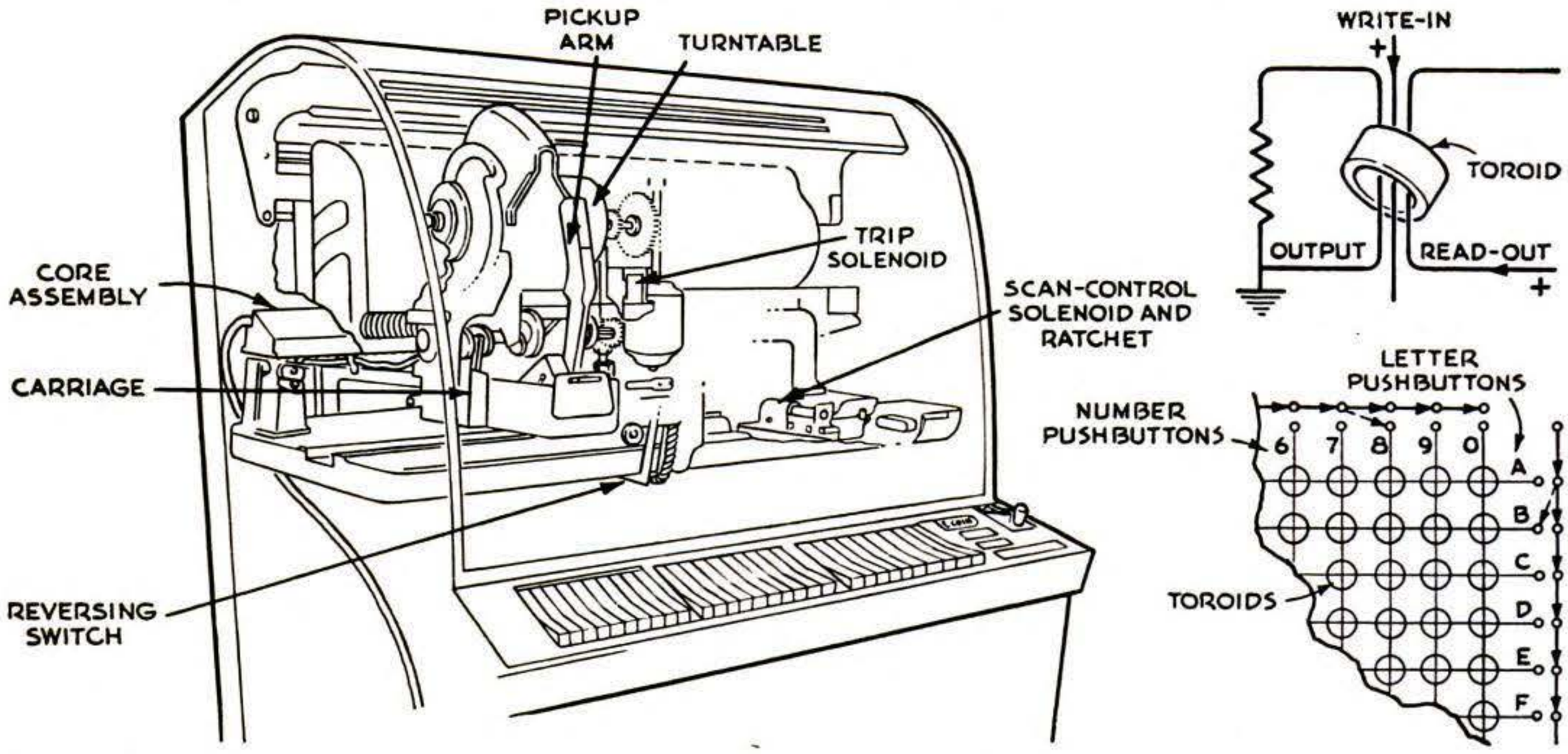
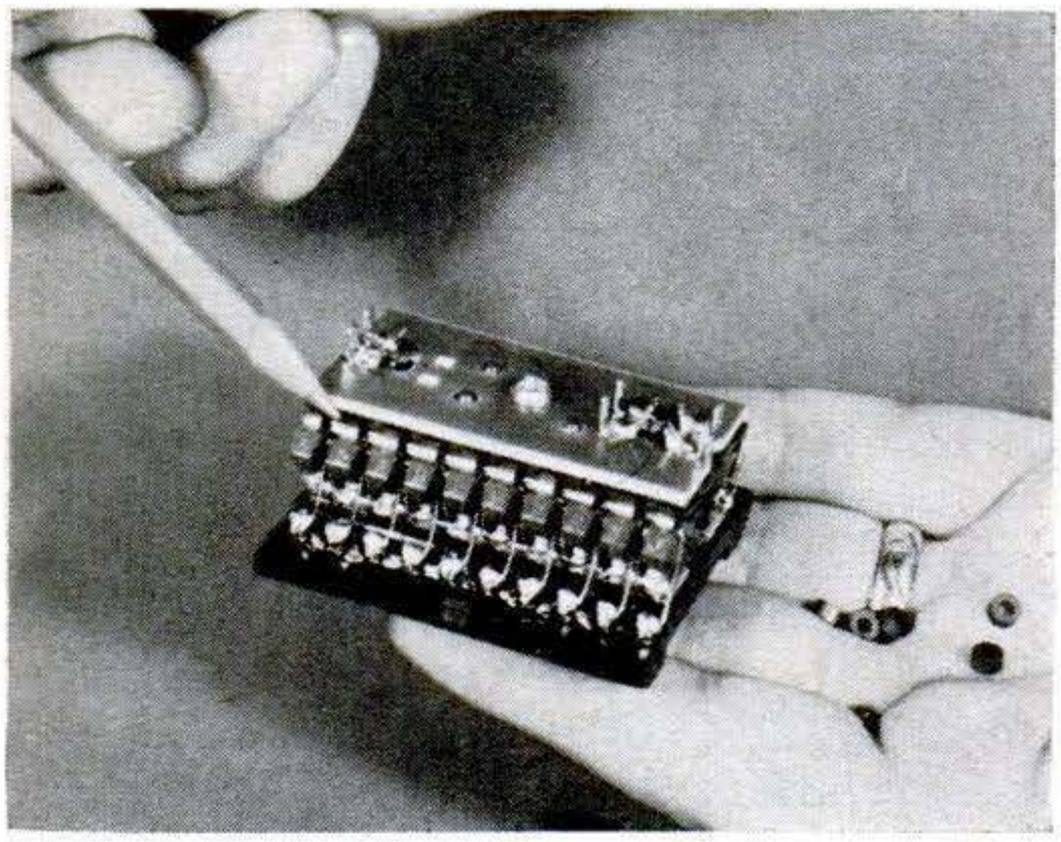
Tiny magnets with a memory pick records off a shelf





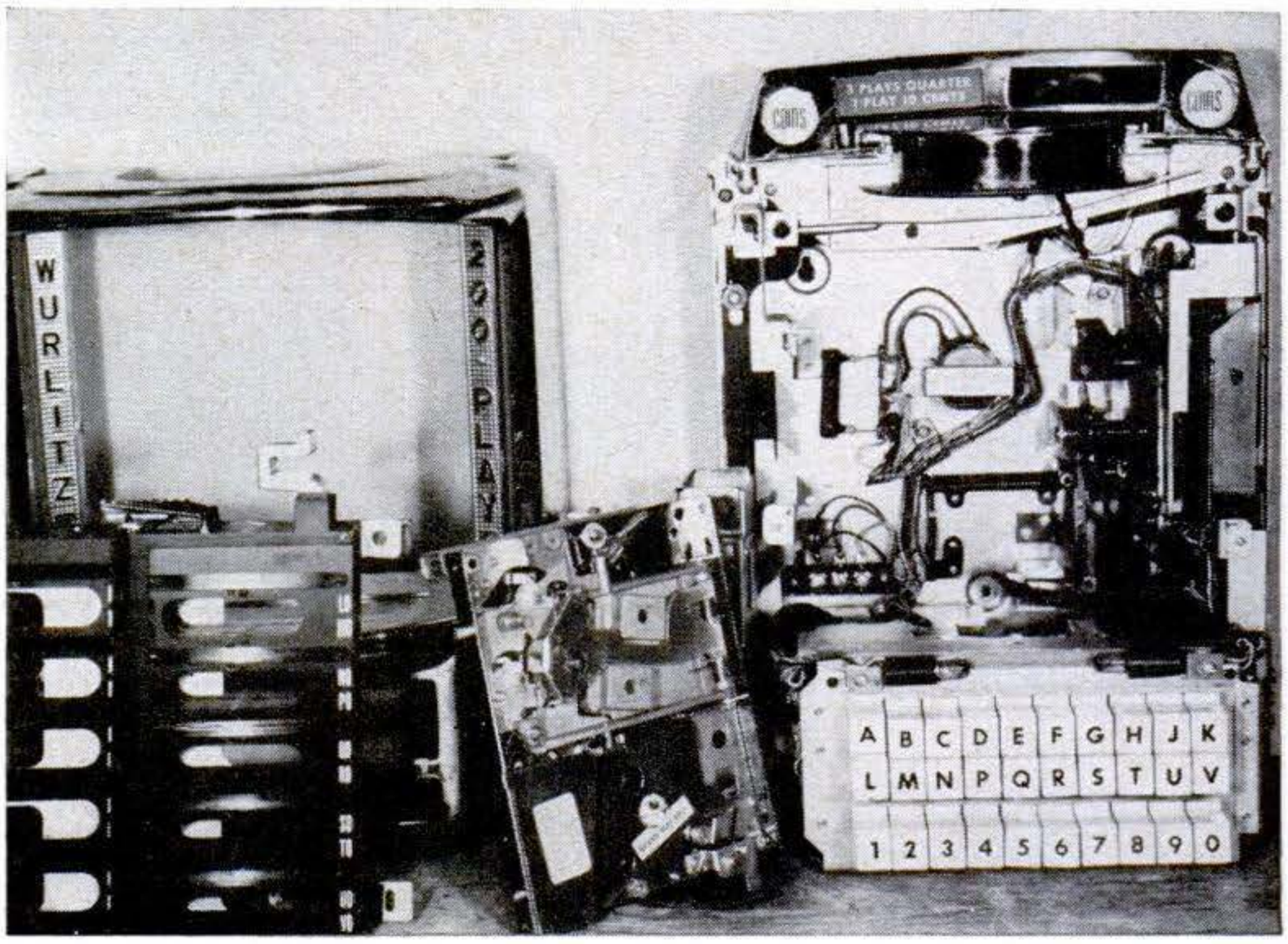
SMALL RING MAGNETS, like slices of windshield-wiper tubing, remember your choice of music in a Seeburg coin phonograph. Behind each record in the magazine are two toroids, each with three wires through it.

As a letter and a number button are pressed, an electric "write-in" pulse changes the magnetic flux in the corresponding toroid. As the carriage searches, it sends a "read-out" pulse through each toroid, so creating an output pulse in the third wire.

A sensing circuit detects polarity of this pulse; that of a selected toroid is reversed, which stops the carriage and starts the play cycle. A cancel pulse restores the magnetic state of the selected toroid to normal. The block at left contains 20 of the 200 toroids together with their associated wiring.

How wall coin boxes pick your platters long-distance

REMOTE UNITS at your elbow take coins, accumulate credits, and telegraph your choices to the phonograph itself. Pressing selection buttons on the wall box sends pulses to a stepper unit in the record player, duplicating the selection process just as if you had pressed the very same buttons there.



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Why Bad Drivers Drive That Way

Stopping and questioning law violators for four days and nights, a reporter gets some surprising answers

By Edward D. Fales Jr.

YOU'RE on a fast road at night. A driver shoots his high beams full in your face—and refuses to lower them. You hang on grimly and grope past.

Why do drivers do things like that?

Then there's the slow driver. You catch up to a line of cars. The leader is slowpoking along at 25 m.p.h., making everybody behind him mad.

Or you're on a trip and you look in your mirror. There's a truck on your tail—so close you can see the mashed mosquitoes on his grille.

How come?

To find out why drivers indulge in such dangerous nonsense, photographer Bill Morris and I spent four days and nights riding with the North Carolina Highway Patrol, recently honored for its safety work. We not only talked to veteran troopers; we *interviewed*

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Slowpokes and bumper-chasers were unaware of

A truck driver, *stopped for tailgating, had a typical explanation—he was trying to make the motorist ahead speed up so he wouldn't have to downshift on the hill ahead. Most drivers violating the safety code professed ignorance of doing wrong. Faces shown here are blanked off to preserve motorists' anonymity.*

A dawdling woman, *endangering traffic around her with her slow pace, said she had to drive under 40 miles an hour because her passenger was afraid to go any faster. Hardly any of the questioned drivers, told that they were not going to be ticketed, resorted to fictions to explain away their erratic behavior.*

a good many of the dangerous drivers they stopped.

We weren't sure, when we started, that we'd get honest answers. But of 30 drivers interviewed, we found only one who, we were convinced, was not telling the truth. We'd agreed in advance with Motor Vehicle Commissioner Edward Scheidt: No driver interviewed would get a ticket, because by telling his reasons he would be performing a service to other drivers and safety experts.

Some of the time we worked in an unmarked car. But mostly we used regular Patrol Car No. 229, a '57 Ford with a Mercury Interceptor motor that packs a mighty wallop when "in chase."

Our driver was a tall Southerner with a voice like a rumbling volcano but an ultra-polite roadside manner. Trooper Lloyd Burchette knows every trick in the driver's book. When he arrests an erring motorist he rebukes him in the sad tones of a grieving father.

The high-beam artists: Police say motorists are rude and selfish. If that's true, we thought, then the characters who attack you with headlights must be the meanest of all.

At eight p.m., 10 miles north of Raleigh on U. S. 1, we met our first "customer." His lights shone like dazzling suns. Burchette blinked for low beams. No luck. We began to squint. You know how it is.

Suddenly Burchette made a squealing stop, reached forward and flicked a switch. Around us the roadside flashed blood red. Burchette had flipped on his "chase light."

This got action. The oncoming car pulled over and stopped on his side. We unstrapped our safety belts and walked over.

Oops! Something was wrong. This driver didn't look as if he hated anybody. *This was a minister.*

"Sir," said Burchette sadly, "don't you know it's illegal and dangerous not to dim for another car?" He began examining the minister's license. I told the minister what we were trying to learn and asked what had happened.

He looked very unhappy.

"I was talking to one of those gentlemen in the back seat," he said. "A delegate."

"A delegate?"

"Yes, we were returning from a church convention."

"But you *must* have seen our lights blinking."

"Well, if I did it didn't register," he

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their faults, or were "pushing" the guy in front

A terminal manager *for a truck company had tailgated because he was preoccupied, planning how he would pick up his small son after school. "I just wasn't thinking of my driving," he said seriously. "It's not like me. I preach to my drivers every day not to tailgate."*

Two college boys, *following the car ahead too closely for safety, said they were talking about an exam and didn't realize they were driving dangerously. Now and then a motorist was found who was sore at a fellow driver and drove in a way to "get back" at him.*

said. "I feel very badly. It is my rule to be courteous. You'll just have to say I wasn't attending to business."

I jotted down: *"Case No. 1. Clergyman. Mind not on driving."*

In the next couple of nights Burchette stopped a dozen headlight offenders and we began to get the picture. We interviewed:

- A salesman who'd been on the road all day. "Second time tonight I've done that," he said. "I'm just groggy. When I'm tired I forget my beams are down and when I meet a car I sometimes kick my lights *up* by mistake. Makes me feel embarrassed afterward."
- A minor court official who'd had a couple of drinks and didn't know "what illumination I was using."
- Several people who said they'd been talking, or fiddling with radios.
- A pretty woman who had just picked up her husband at an airport after a business trip and was so happy to see him

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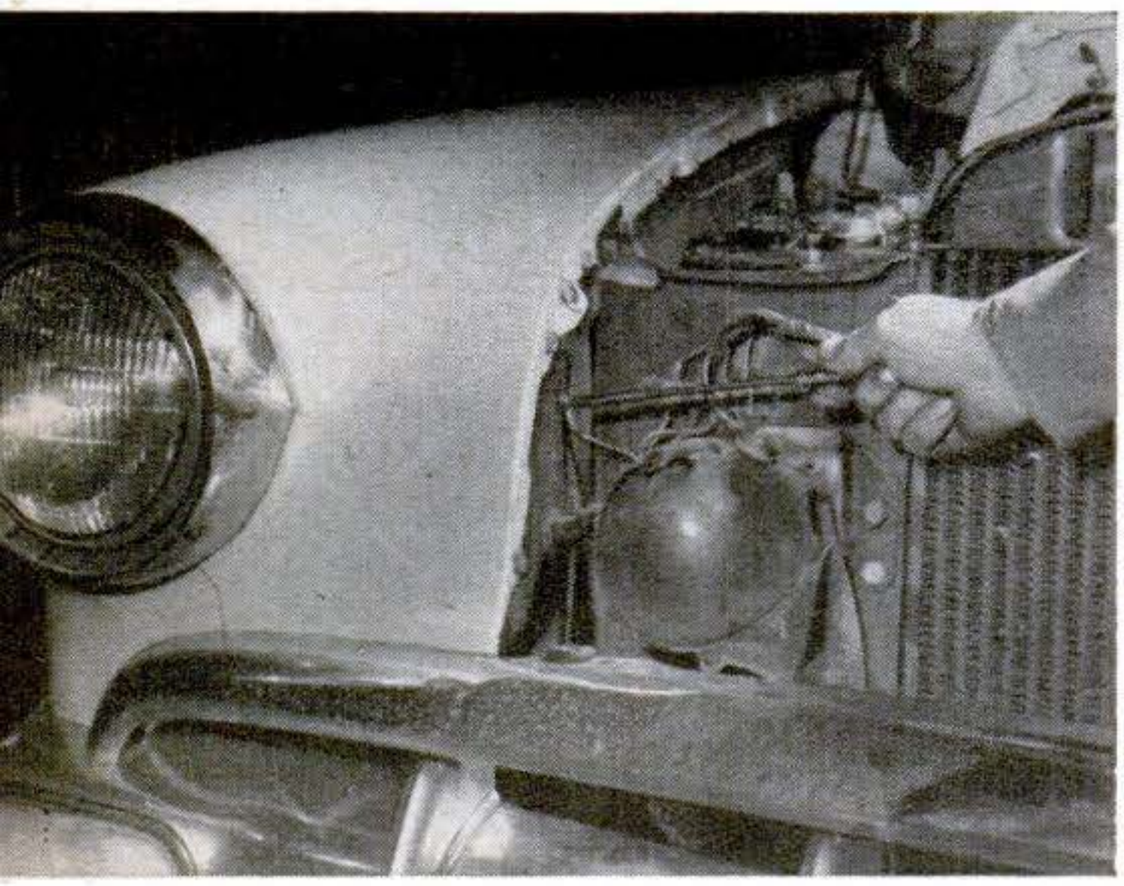
Wiring error can mismatch lights

SOMETIMES the driver isn't to blame. An error by a service man can create one high beam and one low one (as above). Most of today's cars use a two-prong plug connector. If this is inserted upside down, or if lights are wrongly wired (below), mismatched headlights result.



that she wasn't paying much attention to the road.

But among all these drivers we found only one real "headlight battler"—a stubborn-jawed man of about 40 driving a new car. In two miles he didn't dim for *anybody*. I asked him why.

"Isn't it agreed among drivers—man to man," he said, "that if you don't lower your lights for me I just *blast on through*?"

Burchette looked at him. "Suppose we all drove that way?" he rumbled sadly. Then I told this man about the tired, confused, or talkative people we'd stopped.

He seemed impressed. "Well, live and learn," he said. "I always thought the other guy wanted to fight."

We shook hands and he drove on—with low beams.

Slowpoke drivers. We were rolling west on U.S. 64 when we saw our first slowpoke. It was the second day.

Winding toward us over the hills came a "funeral parade" of 10 cars behind a "creeper." Car after car edged out, trying to pass. One took a chance and made it.

Burchette waited until the parade went past us, then fell in line. After a while he began to work ahead in spurts. The slow driver's speed was varying from 40 down to 26 m.p.h.

We got to the head of the line and pulled the car, a red sedan, over. The other drivers glanced at Burchette gratefully as they went by.

It was a car full of women. The driver sounded surprised. "What did *I* do?" she demanded.

Burchette said: "You are breaking the law and endangering all those cars, ma'am."

I asked: "Why were you driving so slowly?"

She said: "Well, we are on our way to a party in Rocky Mount. We started too early, and I was killing time."

"Didn't you see the cars behind you?" I asked.

"No," she said, looking me squarely in the eye. But her face reddened, and this time I didn't believe it. Burchette had a little talk with her—told her to pick up speed, then kill time *after* she got to Rocky Mount.

We stopped five other slowpokes and found:

- One man blocking traffic on U.S. 1 at 35 m.p.h. had a towel around his neck and a handkerchief in one hand. I thought he was crying. "Yes," he said, "I saw the cars behind me, but I just *can't* go it any faster. I've got the flu."
- Another, doing 20, said his tires were unsafe. (They were, too. Thin as paper.)
- A third said he'd had "one beer," had hit a boulder, damaged his clutch, and was creeping to a garage.
- An old man, doing 25 in a drizzling rain, complained he couldn't see through his windshield. It had been cleaned with the kind of cleaner that leaves oily streaks when the wipers are going.

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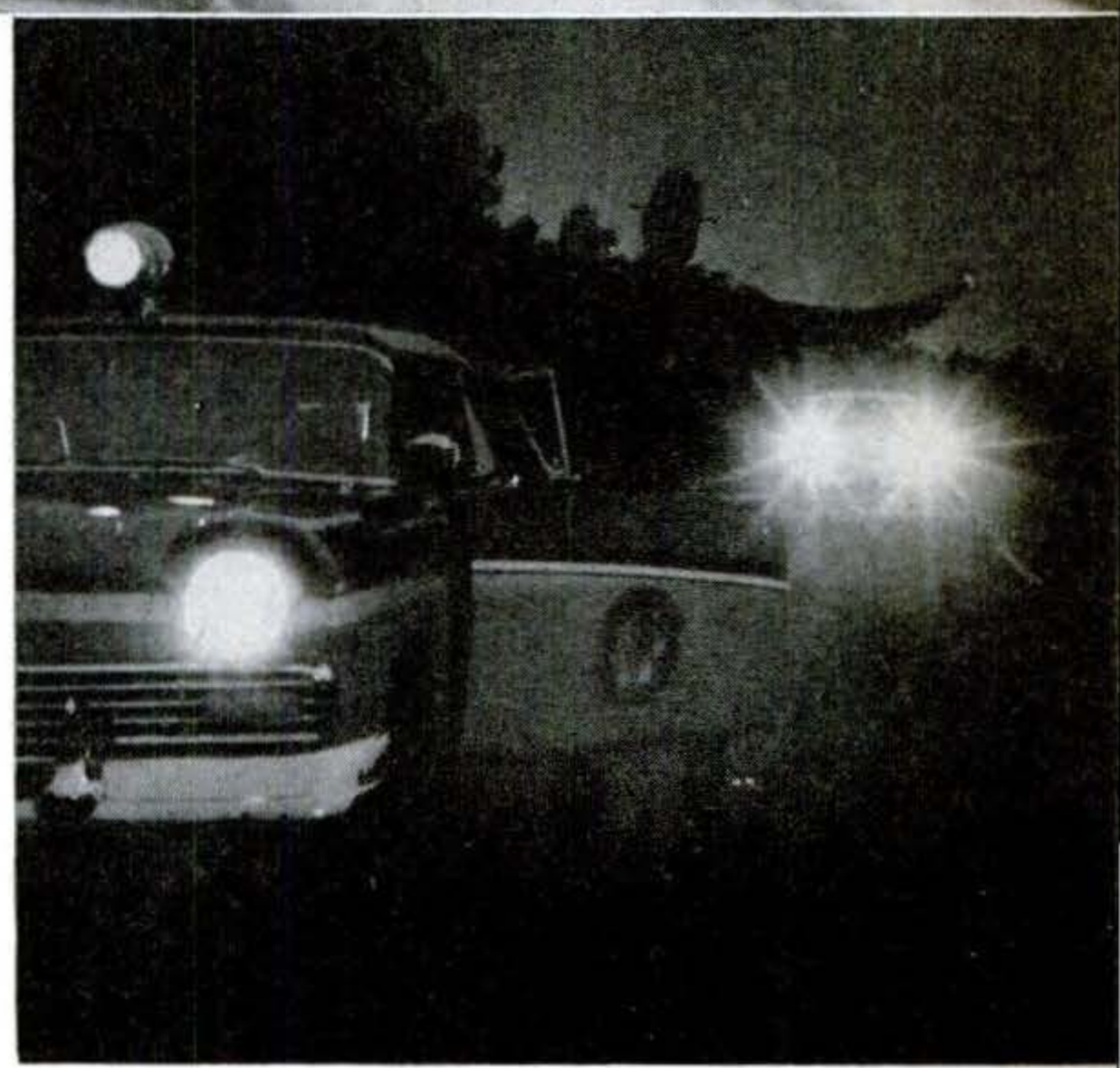
The second car in line *(above) often can be blamed for the pile-up of cars behind a pokey driver on a two-lane road. He's afraid to pass, and the other drivers are loath to try passing several cars at once. The cop is about to untangle this snarl.*



The high-beam addict *in the car at right admitted that he was mad and knew exactly what he was doing.*

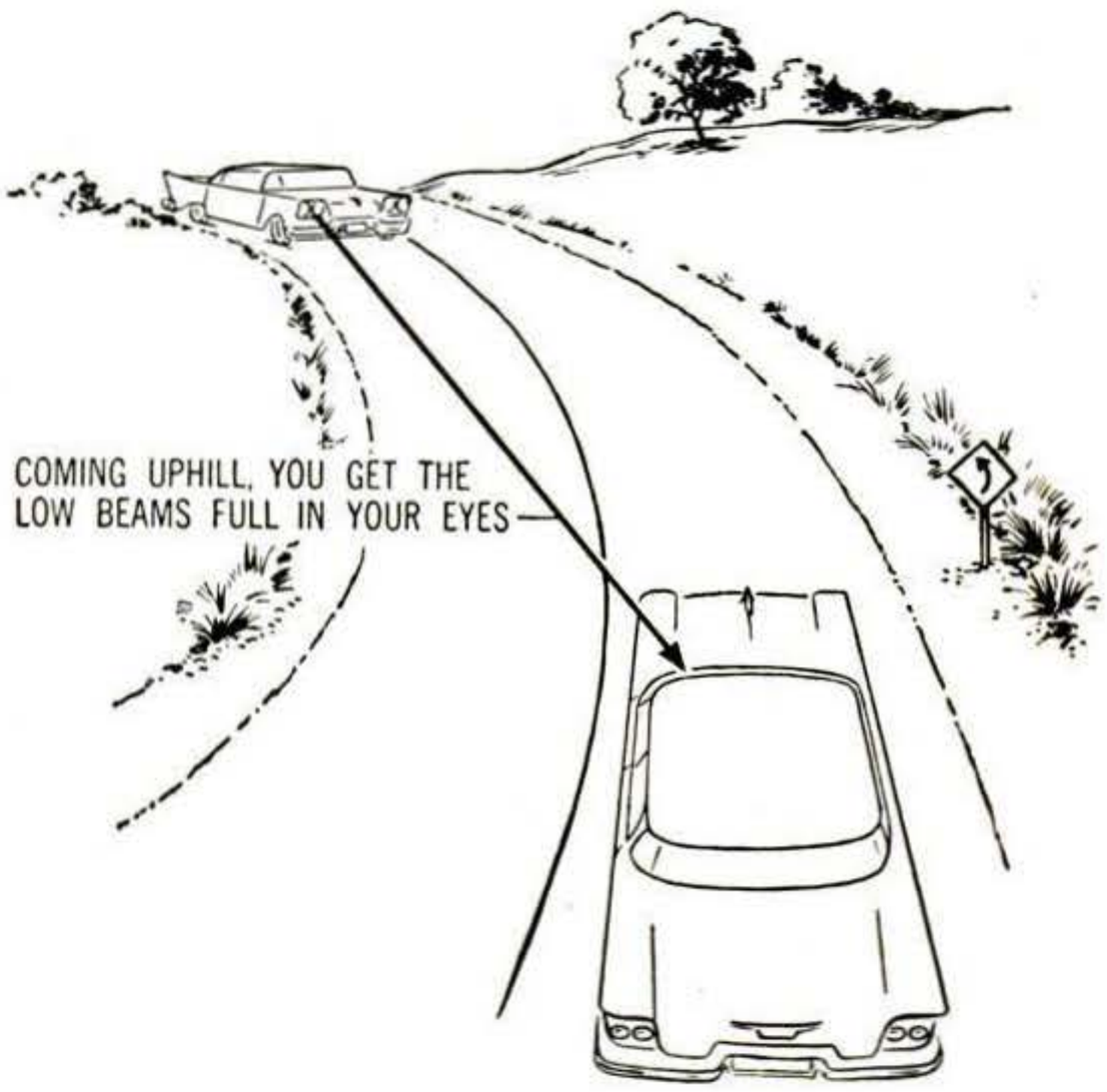
• A woman said she had a passenger who was afraid to go over 40.

Thus only one slowpoke driver was deliberately blocking traffic for selfish ends. The others all had reasons. But not one seemed to realize how deadly a slow car is in today's traffic.

Bumper-chasers: We switched to an unmarked car because no smart driver

[Continued on page 194]

How headlight courtesy can go astray



OFTEN a motorist will stab an oncoming car with what appear to be his high beams when he actually has depressed his lights in common road courtesy. The reason is simple—he is cresting a hill, and to the car on the grade below, his low beams, shining down, for a brief moment strike where his high beams normally would.

There are two remedies for this: The driver can delay low-beaming until the other car is in his sights, or he can install a compensating automatic dimmer.

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Scientists report surprising new details about:

How Your

HOW much energy do you use when you think? At what time of day is your mental performance best? Does talking to yourself help your thinking? Are your thoughts influenced by body position? If you have an exam to take, or some problems to solve, how can you let your mind work, without your realizing it, to find the answers?

Of all things known in the universe, the human brain is, by far, the most complex. As a subject for scientific study, it presents infinite intricacies and difficulties. Wide divergences of opinion exist among investigators who are trying to probe its mysteries to establish basic facts. But recent research provides some new facts about how our brains work.

How much energy does brainwork take?

One of the most surprising recent discoveries is that you apparently use little more energy when you think than when you don't. University of Pennsylvania investigators believe this is so after checking on brain-energy requirements by measuring oxygen consumption in a group of subjects while they idled, did problems or slept. The finding: virtually no change throughout. The conclusion: Your brain, unlike a machine, uses most of its energy "merely in keeping its circuits alive and sensitive," and needs insignificantly little more when you use the circuits.

At what stage of problem-solving does your mind work hardest?

Here's another surprise finding: You do more brainwork preparing to solve a problem than in actually solving it. So believe Michigan State University psychologists who tested 60 volunteer students by ringing a doorbell at various times while they were reading a set of problems, again later as they worked on the answers. There were many more errors when the distraction came during the reading time than when it came during the solving period. Actually, ringing the bell during the answer period speeded responses, apparently because of increased tension.

Does your body become tense when your mind is busy?

A Lehigh University psychologist used an electrical device to measure activity in muscles and found that during severe mental effort—for example, when you're doing arithmetic problems—"tensions seem to flow over the muscular system like the waves of the sea. One muscle is in a state of rise while another is subsiding, at a very slow rate." Most likely to be most tense: the arm muscles.

Is there a best time of the day for mental performance?

Yes, although it may vary with the individual. Scientists at the University of Chicago have found that fluctuations in

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Mind Works By Lawrence Galton

mental performance seem to be related to variations in body temperature. Generally, the temperature tends to be falling when you go to sleep and to be on the rise when you wake, and top mental performance seeems to occur when body temperature is at its peak. But peak temperature time may vary with the individual—which may explain why some people are "early birds," keen first thing in the morning, while others are late starters. On the average, the peak of body temperature and mental acuity, according to the Chicago studies, occurs in the middle of the waking period.

Do you think faster than you talk?

Much faster, according to studies in the Pennsylvania State University psychology department, which indicate that the average person speaks at a rate of 125 to 160 words per minute while thinking four times more rapidly.

Do you talk to yourself when you think?

Probably, yes. The measure of human intelligence, suggests Dr. Albert Goss, University of California professor of psychology, may be based on how broadly we can converse with ourselves.

You may not talk out loud—although some people do on occasion. But verbal cues—verbal instructions we give ourselves—provide the basis for most of our learning, according to Goss. For example, if you drive to work, for the first several times you take a new route you tell yourself to turn left at the green house and right at the gasoline station. Afterward, the route becomes automatic. Similarly, when you choose a tomato at the market, you generally follow instructions you've given yourself. The color, you've told yourself, should be a certain shade of red; size may be important; there should be a certain degree of firmness.

Children, the California scientist reports, seem to learn faster once they learn to talk to themselves—that is, make use of verbal cues.

How much storage capacity does your brain have?

Although, on the average, brain weight at birth is only about 12 ounces and even in an adult only about three pounds—usually a few ounces more in men than in women—its storage capacity is phenomenal. According to one estimate reported in *The Human Brain*, by John Pfeiffer, the brain is capable of storing more impressions, facts and total information than are in all the Library of Congress' nine million volumes.

How much of your brain do you actually need?

Apparently, you could get along well with as little as half of it if necessary. The medical journal *Modern Medicine* has

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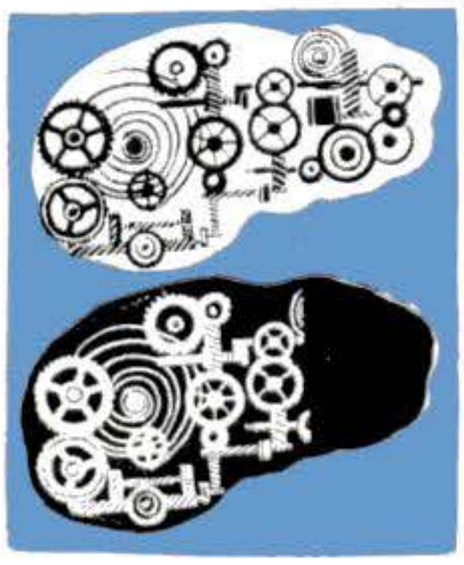
called attention in a recent editorial to a number of reports of even professional men—doctors, lawyers, and others—who have been able to go on with their regular work after removal of much of one side of the brain because of tumor. Reported a few months ago, too, was a study of 62 soldiers who suffered penetrating head wounds during World War II. When these men were retested for intelligence, they showed little or no change in the scores they had made in the Army General Classification Test upon first entering service some 10 years earlier.



Although, at various times, psychologists have believed that the brain is highly departmentalized, with specific areas for specific functions, some recent studies indicate that when what appears to be a specific area is damaged, another brain area may be able to take over its functions. And at its last annual meeting, the American Psychological Association witnessed an unusual demonstration. A 39-year-old man had had to undergo an operation to remove the entire right half of his brain. Tape recordings of psychological tests given to him before and after the operation were played at the meeting, providing clear evidence that the man's intellectual capacity continued virtually unimpaired.

Do intelligence and hand dexterity go together?

Yes. The popular idea that children who fail in the three R's will excel in use of their hands is wrong, according to Dr. M. H. Fouracre of Columbia University, who has recently reported studies showing a high correlation between intelligence and manual dexterity.

Can you learn while you sleep?

Although many claims have been made that you can, latest scientific evidence is against the possibility. In a careful study made by Dr. C. W. Simon and W. H. Emmons of California, 21 men were tested on 96 factual questions on history, sports, science, etc. Then recorded questions and answers were played to them at five-minute intervals throughout the night while continuous brain-wave measurements were made.

The waves showed that drifting off to sleep involves a definite progression—through light-drowsy, drowsy, and deep-drowsy states before the line between being awake and asleep is approached, after which there is first light, then deep and finally very deep sleep, each state marked by its own brain-wave pattern.

Next morning, when the men were tested again to determine which questions previously missed could be answered correctly, it was found that those questions and answers played during the drowsy levels as shown by the brain-wave recordings could be recalled by the men, but those played during actual sleep could not be recalled. Conclusion: Learning is possible during a drowsy state but not during actual sleep.

Is there any relationship between baldness and brains?

If there is, no generally acceptable scientific proof has been found. However, a theory recently offered by Dr. Wharton Young, professor of anatomy at Howard University, will be

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flattering to all men and especially to those who are bald. It holds that in men, the brain is constantly growing, expanding the cranium and stretching the top of the scalp so that the fat layer under the scalp is squeezed, depriving the hair roots of adequate blood and nourishment. This can reach a point where the hair falls out.

Women, according to Dr. Young, tend to keep most of their hair because their brains, which are smaller to start with, grow more slowly.

Are women's mental abilities any greater or less than men's?

No. Most scientists agree that men and women are fairly equal in mental ability. There are, however, some specific differences between the sexes. A Stanford University study for the Office of Naval Research shows that, other factors being equal, men are as much as 50 percent better than women in solving complicated problems.

However, mental ability, or intelligence, is an aggregate of many special abilities, and problem-solving is only one. And while many studies have shown that men also excel in information subjects such as history and science, and in others that demand numerical reasoning and spatial aptitude, women are superior in reading, language, spelling, and arithmetic.

Is there a close relationship between genius and insanity?

Not according to a 17-year study in Germany by Dr. Adele Juda. It covered 294 geniuses and their families. One hundred thirteen were artists; 181 scientists. Out-of-the-ordinary personality traits were frequently found. There was a higher incidence of psychoneurosis than in the general population, too. But severe mental illness was relatively rare—under four percent.

Some other findings: The greatest number of geniuses come from thickly populated areas and racially mixed groups. Geniuses show a definite tendency to be first- or second-born children. Seldom are both their parents especially young or especially old, although one often is. Rarely does extremely high endowment appear suddenly in a family; ancestors as a rule show parallel talents (high manual dexterity for the artist group, for example, and successful professional careers for the scientific group). Brothers and sisters of geniuses and their children and grandchildren have high endowment, too. Wives of geniuses also show a high incidence of superior intellectual and artistic talents. And, on the whole, marriages of geniuses are happy.

Is it true that someone else can read your mind?

Definitely not, according to a Michigan State University psychologist, Professor Milton Rokeach, although something resembling mind reading can be done with practice, by "muscle reading."

In fact, one of history's most outstanding muscle readers was Clever Hans, a horse which performed amazing feats in Germany at the turn of the century. Owned by a man who believed sincerely that higher animals had intelligence equal to men, the horse was carefully schooled in arithmetic,

[*Continued on page 200*]

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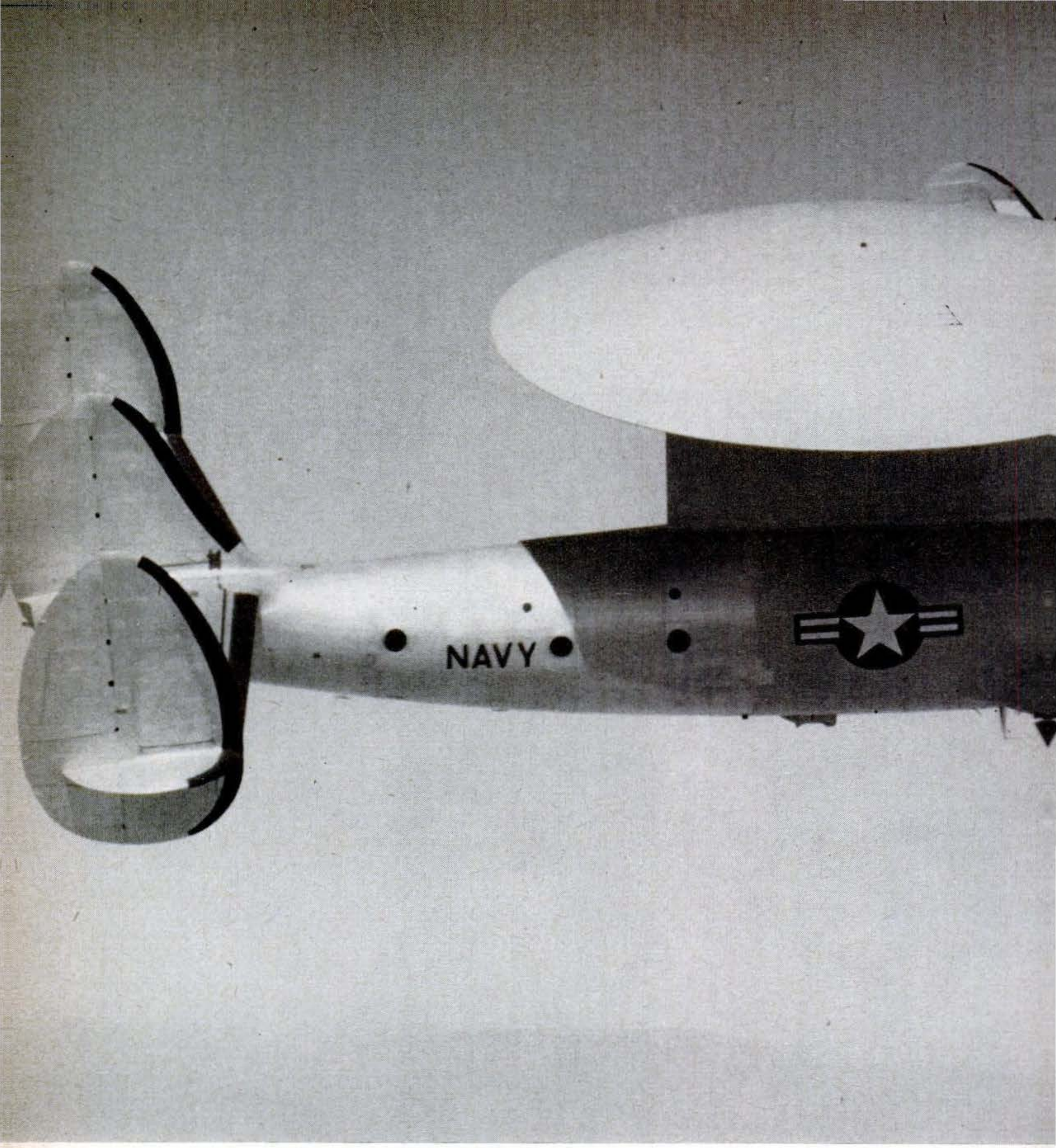
NAVY

"Flying saucer" rides piggyback. Strangest sight in the sky, the Navy's latest "flying saucer" encloses the world's biggest airborne antenna and most powerful aerial radar. The apparatus rides atop a craft known as a WV-2E radar research plane—a military version of Lockheed's Super Constellation. The radome, 37 feet in diameter, houses a radar antenna nearly twice the size of an earlier model (PS, Oct. '56) and capable of picking up signals 70 percent farther away. The antenna, rotating inside its shell, can detect objects from sea level to 100,000 feet.

The new plane has been put into experimental operation at the South Weymouth, Mass., Naval Air Station, flying the mid-ocean extension of the U. S.-Canada Dew Line early-warning system.

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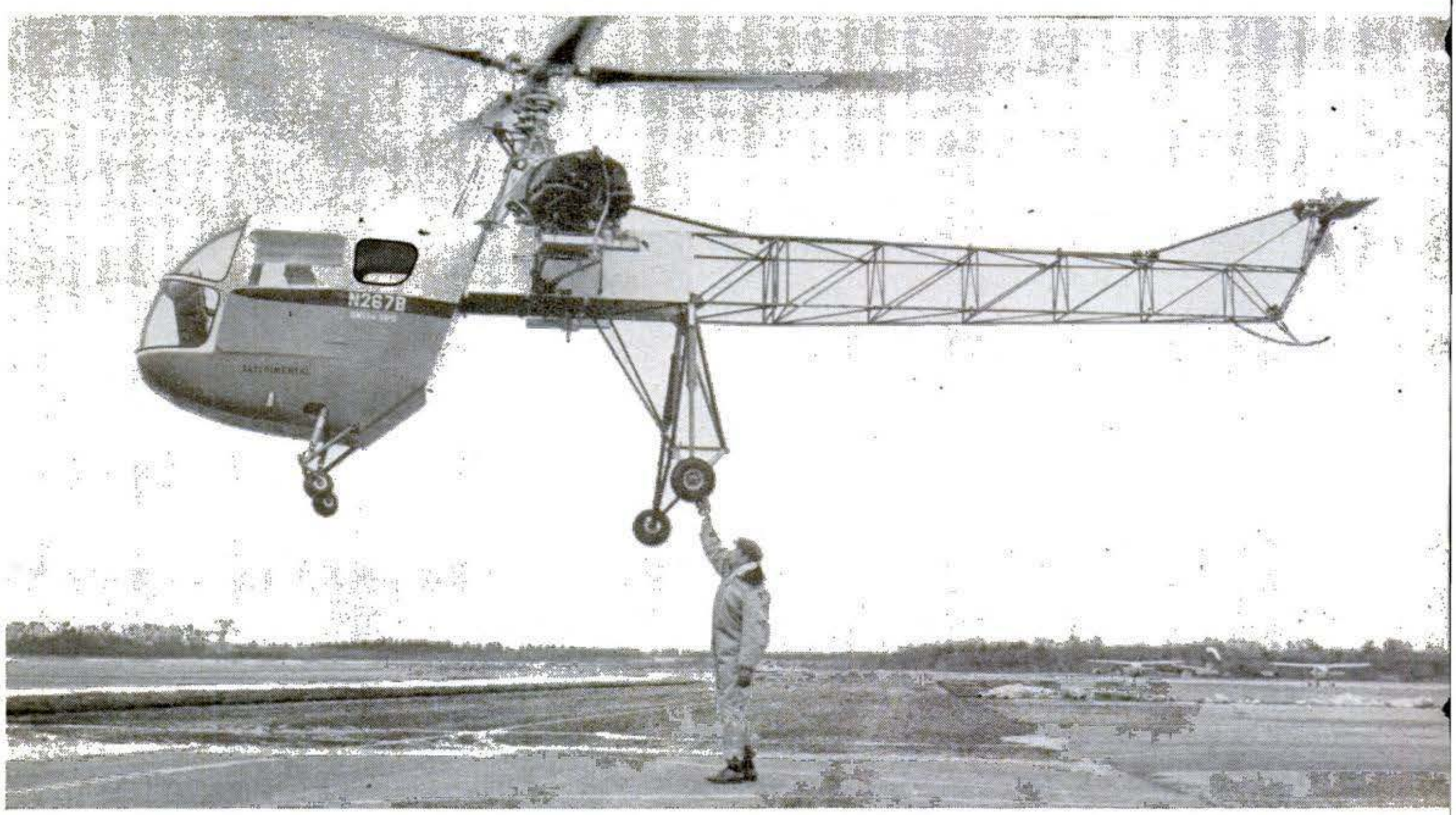
Hurricane house. Built on nine-foot-high V-shaped steel stilts, this four-room beach house is designed to withstand seashore storms, hurricanes and tidal waves. Stilts are anchored to a 41-yard block of concrete. The house is prefabricated by the Pre-Bilt Construction Co. of North Dartmouth, Mass. It is available with the interior finished or unfinished.



Whirlybird flying crane. Here is a helicopter that's different. It carries its load behind the passenger compartment, instead of underneath, enabling it to fly close to the ground. The Omega BS-12 "Twin" Utility Flying Crane is a commercial version of a smaller experimental model

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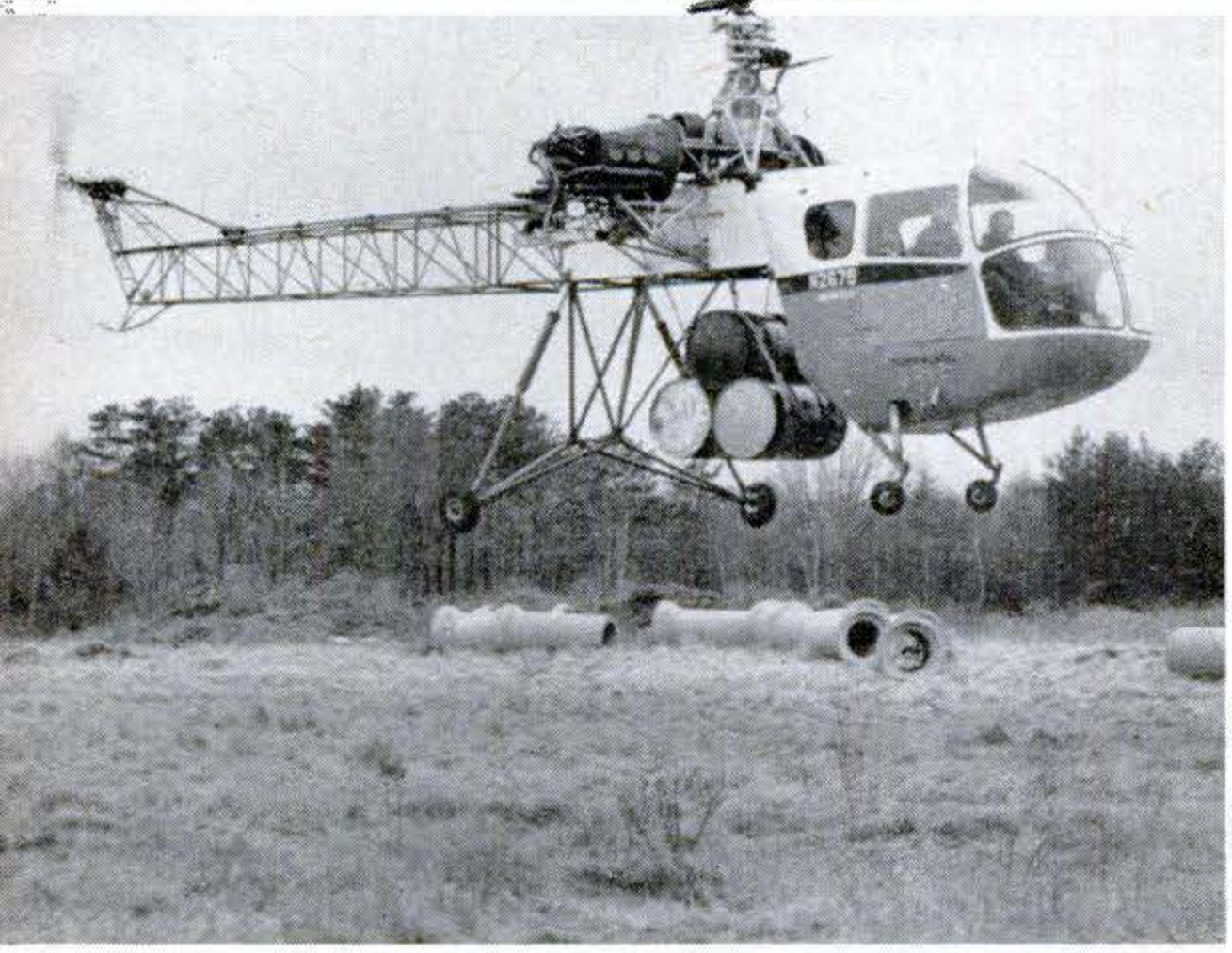
Umbrella roof. A crane lifts a temporary roof onto a pressure chamber, above, of the British nuclear power station at Berkeley, Gloucestershire. In place it enables workmen to complete welding operations in any kind of weather. A three-inch-steel permanent roof weighing 10 tons will replace it when the power station, one of 16 being built, is finished in 1961.



tested a year and a half ago. It has two externally mounted engines to permit ease of maintenance or change of parts in minimum time, weighs 3,125 pounds, carries a pilot and four passengers, and a 1,440-pound load in a sling or pods. It has a winch for automatic pickup and unloading.

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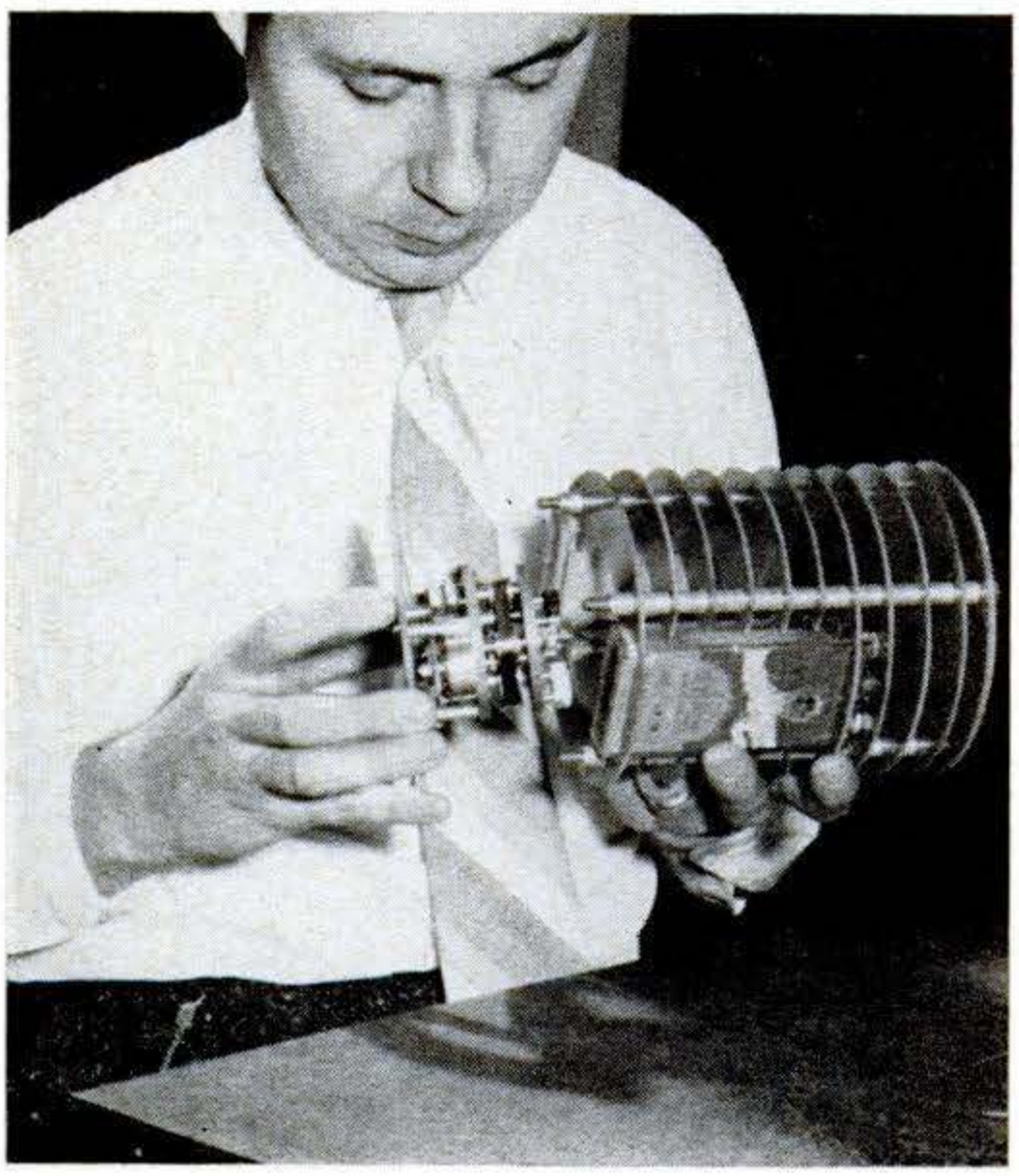
World's biggest world. A giant 52-foot-diameter sphere is shown here at New York International Airport before being deflated and flown to the Brussels World's Fair for the Pan American World Airways exhibit. It's made of vinyl-coated nylon. Inside walls are a planetarium showing the summer sky over Brussels with interchangeable twilight, moving clouds and night effects. Sightseers are admitted by an airlock door.

Inboard-outboard landing craft. A 350-hp. inboard and an outboard propeller-rudder give this 36-foot landing craft unusual maneuverability. Steering is done with the propeller, which swings in a circle. The boat built by Kettenburg Boat Works, San Diego, and the propulsion unit by Waste King Corp., Los Angeles, are undergoing Navy tests.

Slide to safety. A new rescue sled that can be used on any ordinary fire ladder is shown here in action at Bad Godesberg, Rhineland city near Cologne, Germany. It slides on small wheels riding the handrails. Helmut Engelhard of the Bad Godesberg fire department pondered how to get injured victims to the ground safely, yet fast enough to free the rescuers for firefighting. He developed the sled as his answer.

Winged destroyer. Multiple recoilless rockets wing-mounted in launchers on Navy attack planes give them the firepower of several salvos from the main battery of a surface destroyer. Shown left to right are a 2.75-inch rocket, Zuni, combination of 2- and 2.75-inchers, cluster of 2.75-inchers, 19-unit launchers for 2- and 2.75-inchers, and a four-unit Zuni.



Memory for a moon. To report on cosmic rays in space, our second-orbited Explorer carried the midget eight-ounce tape recorder shown above, close-up; and, at left, being fitted into its housing.

Designed at the State University of Iowa, the device "memorizes" successive readings of cosmic-ray intensity by a Geiger counter in the satellite. Then it reads them back over a transmitter, on radio command from a ground station.

Only a fraction of our first Explorer's cosmic-ray measurements were recovered, since they were transmitted as fast as made, and were heard only when the satellite was within range of some ground receiver. By storing data, the tape-recorder method can preserve it all—particularly aiding studies of how cosmic-ray intensity varies with latitude, or increases for a few hours during a solar flare.

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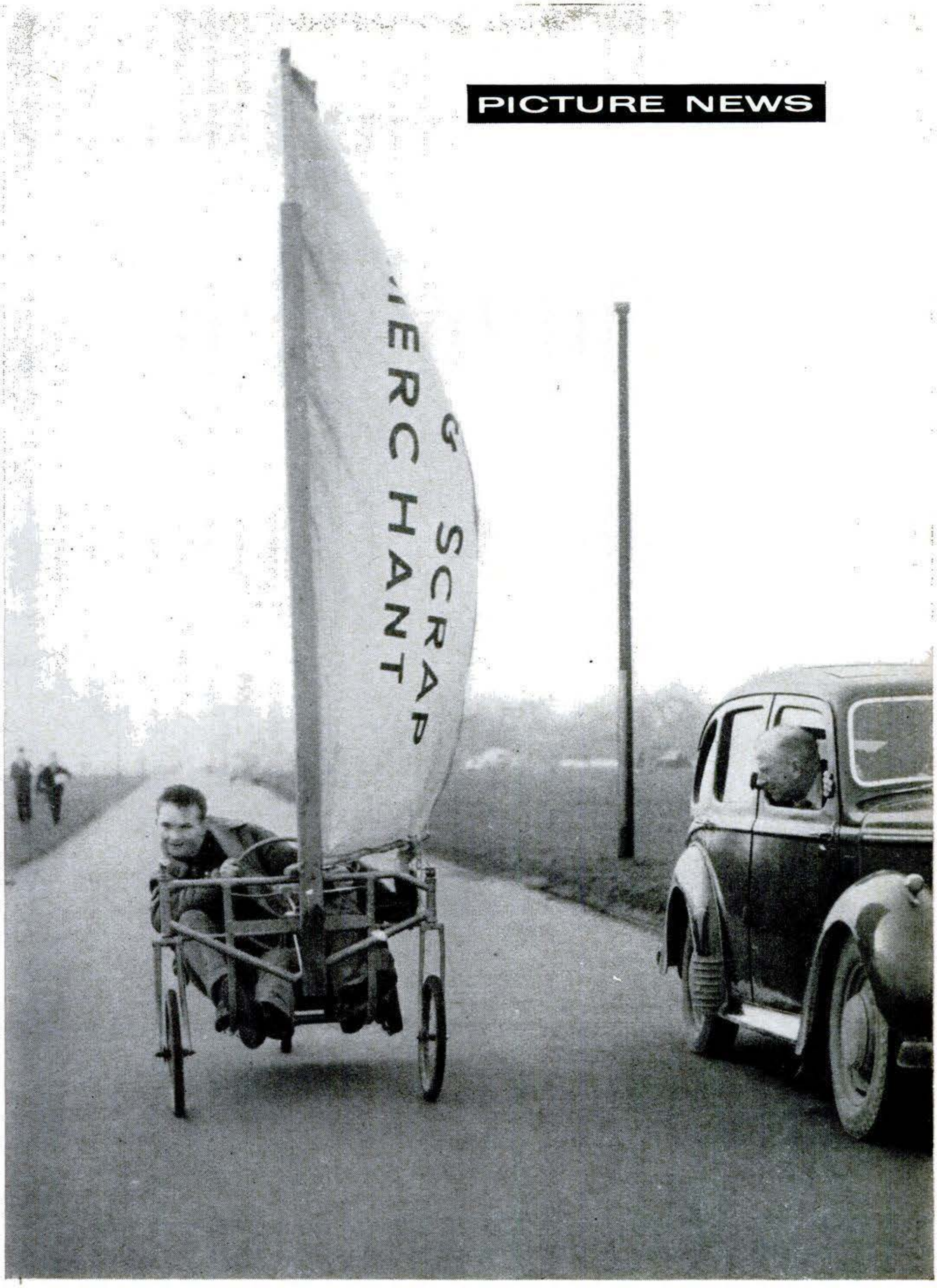

Land yacht breezes along. Here is a highway vehicle that is guaranteed to be low cost in fuel. It is powered by sail and depends only on a good, stiff wind for propulsion. It was built by James Witham of London from the front forks and wheels of three bikes and some gas pipe. An old Spitfire-airplane steering box is used to steer the contraption. It's a two-seater: The passenger's head is behind the sail.

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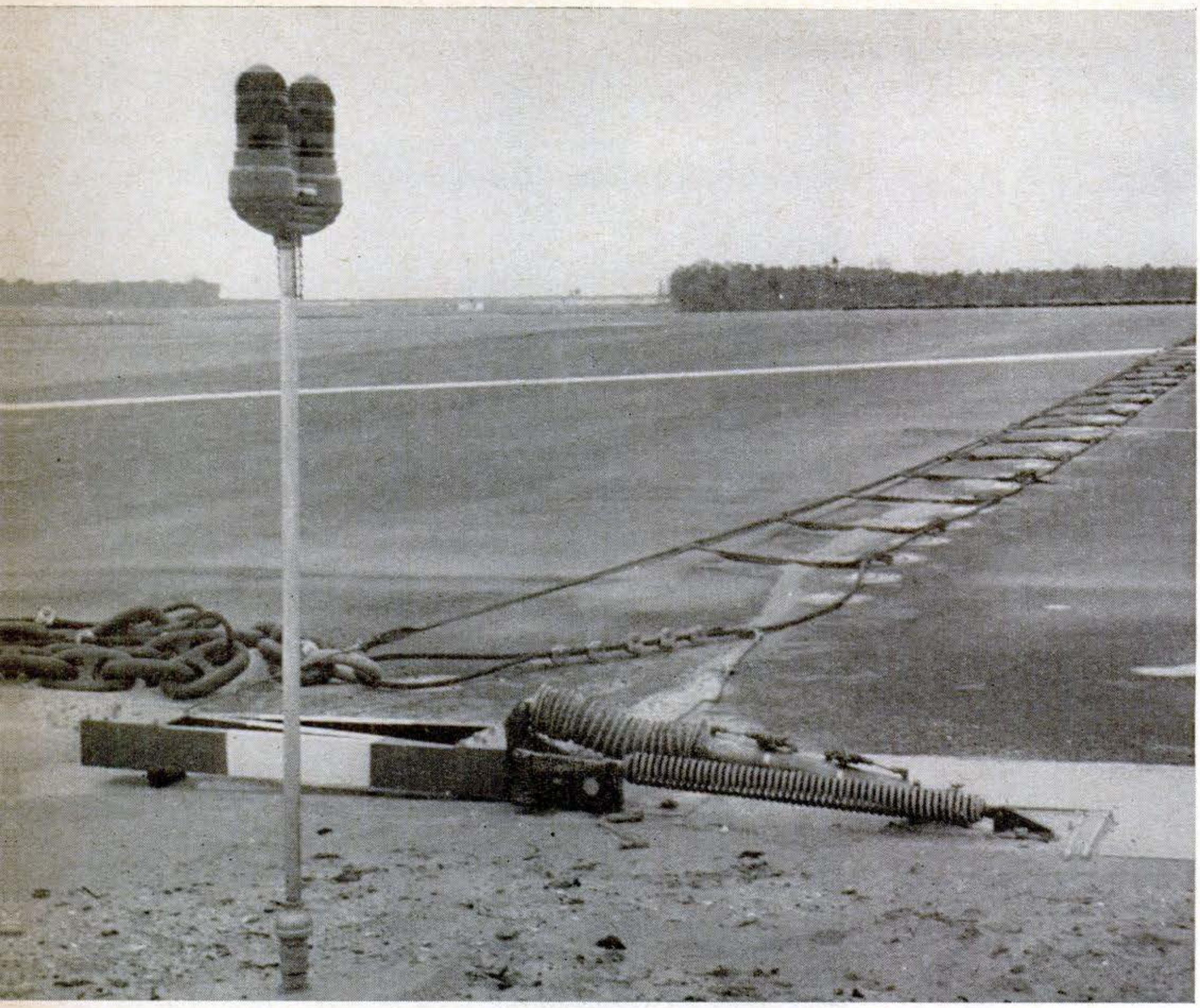

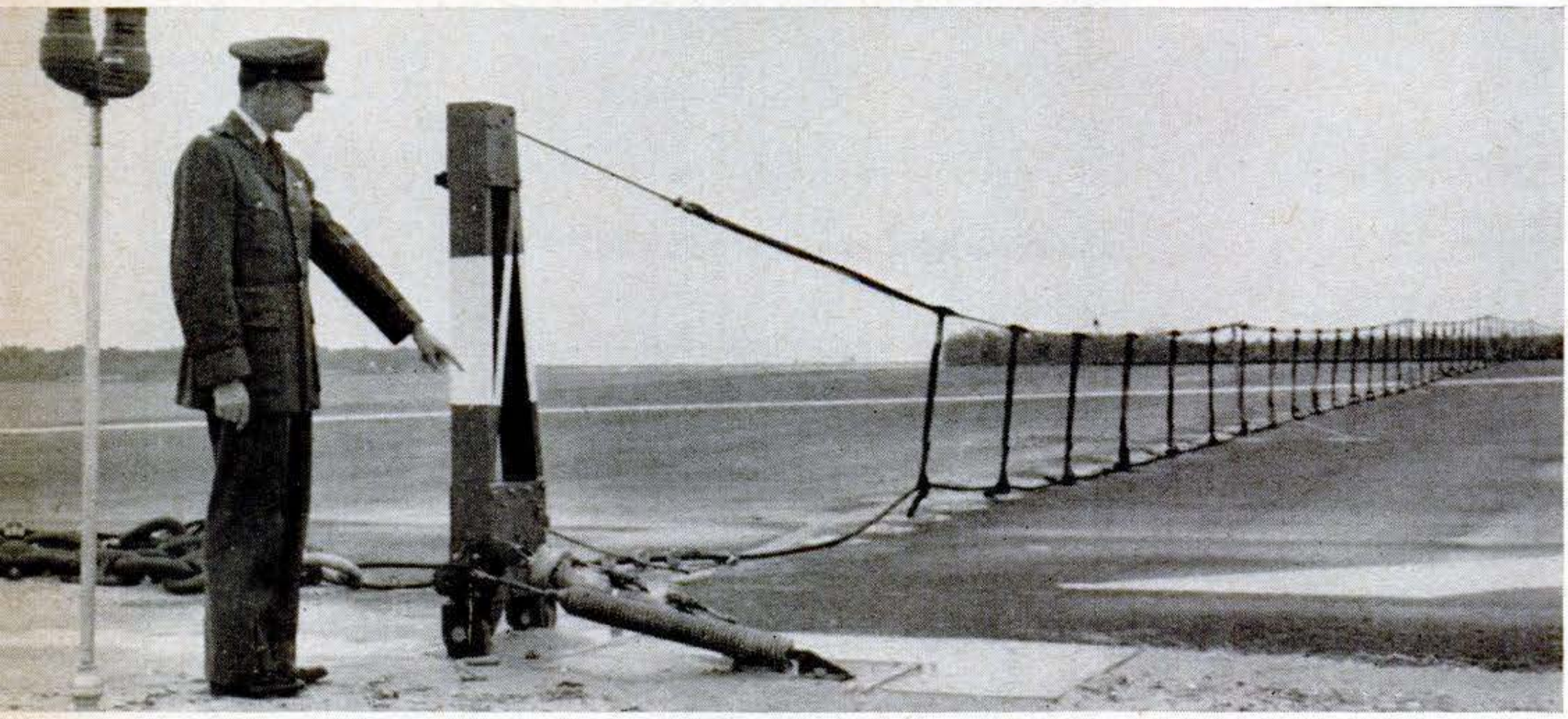

Pushbutton makes landings safe. When a control-tower operator at Eglin Air Force Base, Fla., sees that a plane coming in to land is going to overshoot the runway, he presses a button. It releases the coil spring shown above, which instantly pulls the nylon barrier erect. The overrunning plane then hooks onto the barrier and drag is exerted by the heavy chain. The more the chain pays out, the greater the drag.

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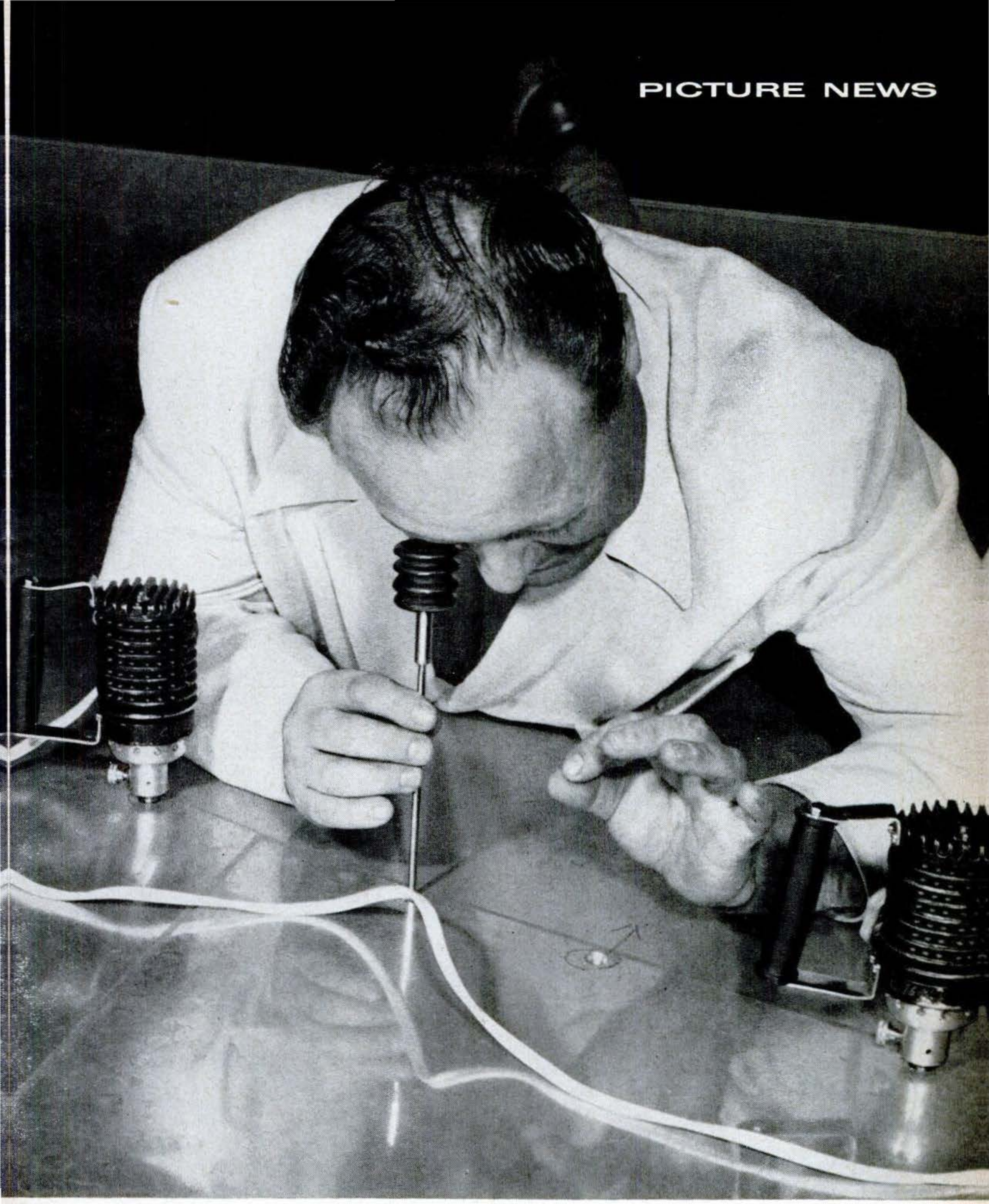

Looking inside the Hustler's wing. A special precision borescope, inserted in a bolt hole in a sealed delta wing of a supersonic B-58 bomber, gives this spread-eagled engineer a view of the interior which he is examining for scratches and other flaws. Checkup is aided by two cold-light tubes inserted in bolt holes on either side. Convair got the idea for the borescope from the doctors' gastroscope and bronchoscope.

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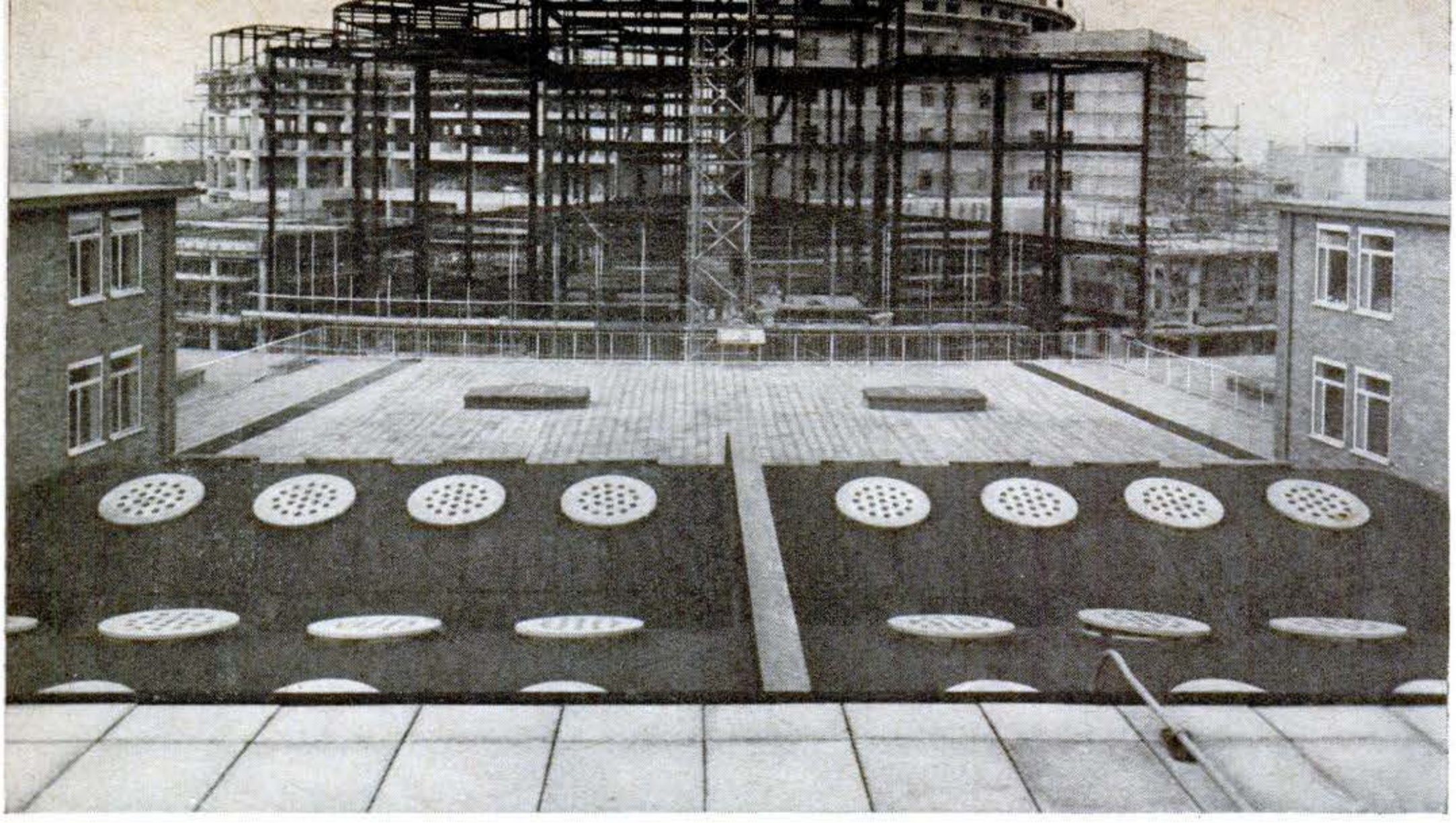

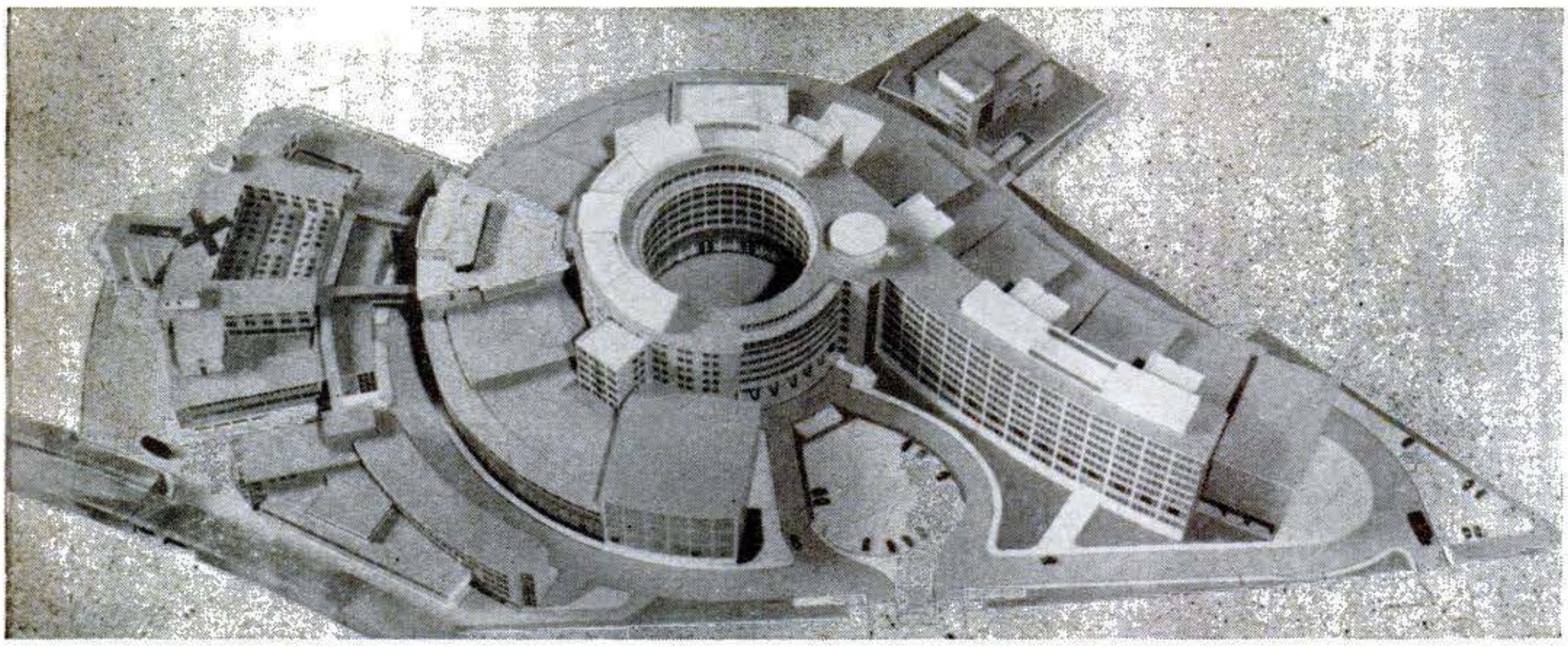

BBC's new television center. Biggest TV installation in Europe, this 13-acre layout will include besides a restaurant and other buildings a main block housing seven studios. Construction photo at top was taken from the roof of the block (marked X on model) in which scenery is made.

One cargo rides two trucks. A 91-ton, 112-foot-long steel box girder was no problem for truckers when it reached Cleveland on three flat-cars. They loaded it on back-to-back trailer trucks, running one in reverse. Workers on top removed wires and traffic lights on its trip.

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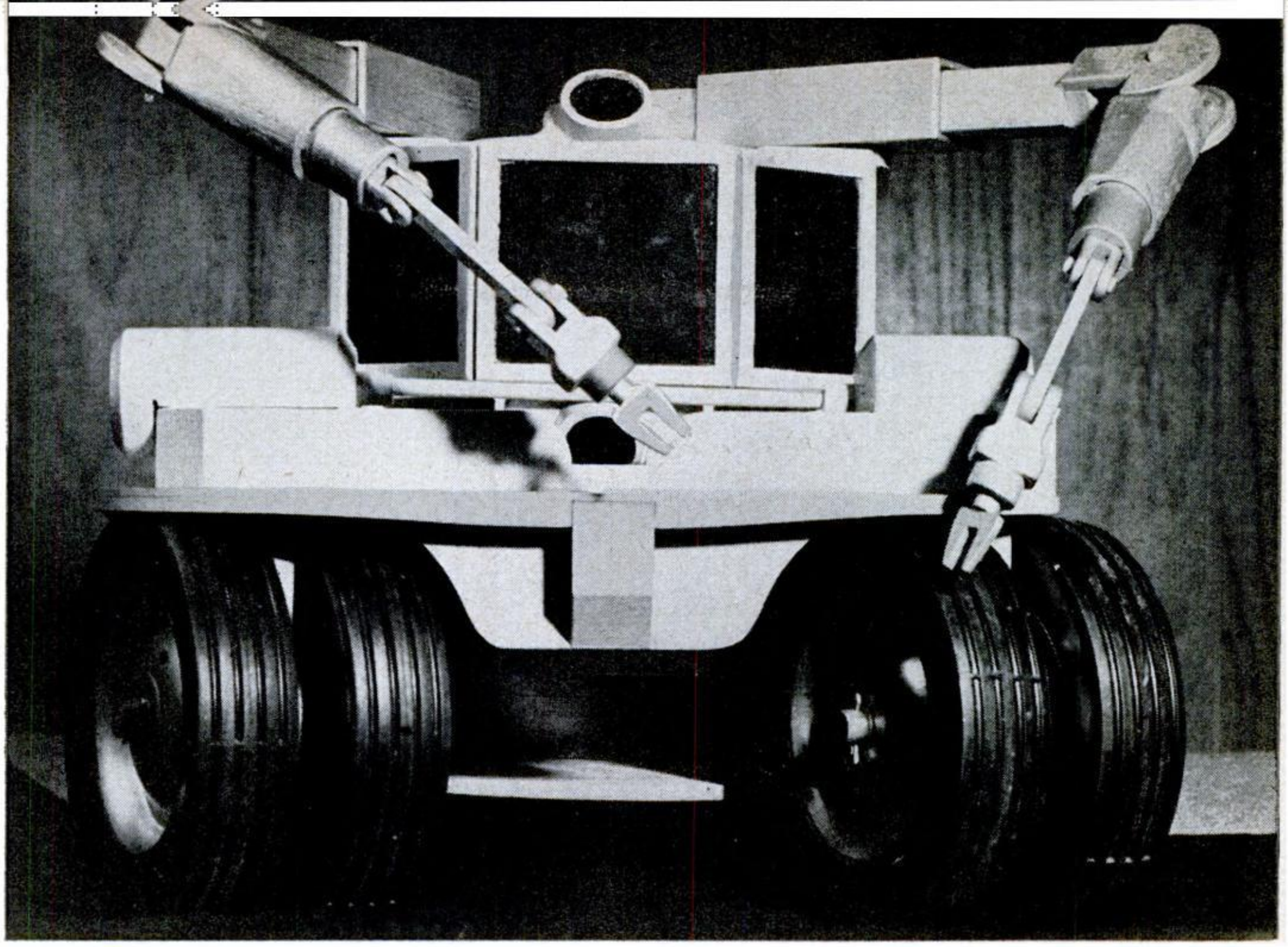
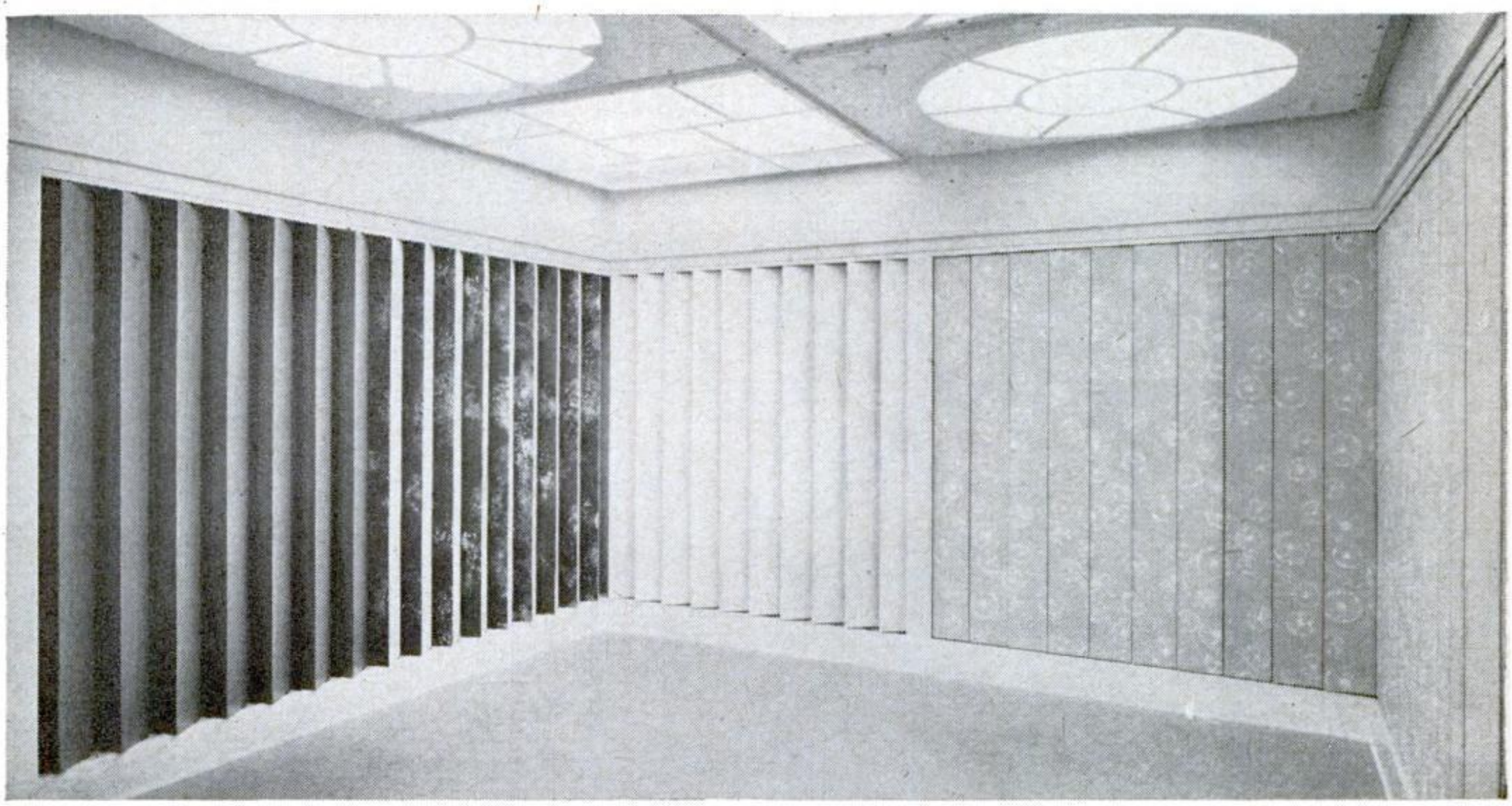


Nuclear grease monkey. Strange-looking vehicles like this Beetle may soon be rolling around airports. General Electric engineers designed this model to show how the plants of atomic-powered aircraft can be serviced. In full size the Beetle would have manipulator-tipped arms 16 feet long with outlets in each hand for operating power tools. It would have "eyes" of 22-inch-thick glass and 75,000 pounds of lead shielding. The cab could be elevated to 15 feet and rotated in a complete circle.



Instant-change wallpaper. These walls are built-in panels of vertically mounted Venetian blinds with a different colored wallpaper on each side. They're in a West Berlin light-bulb maker's showroom. Turned by a crank, they show lighting effects on various colors.

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Pipeline tour on wheels. There is no more stooping and crawling for workers who inspect the 100 miles of pipe for a water line between Stuttgart and Sipplingen in Germany. This three-wheeled vehicle makes the job a cinch. The workman in front steers with his feet and inspects the interior wall while a companion in the rear pushes on the bicycle pedals.

New helmet made for tankmen. Instead of wearing standard M-1 steel helmets or football headgear as in the past, Army tank crewmen now have their first helmet built specifically for their needs. It's made of laminated nylon, weighs three pounds, wards off bullets and shell fragments, and cushions against bumps and shock. Mounted on it are a microphone and a switch for talking, listening or tuning in on the intercom.

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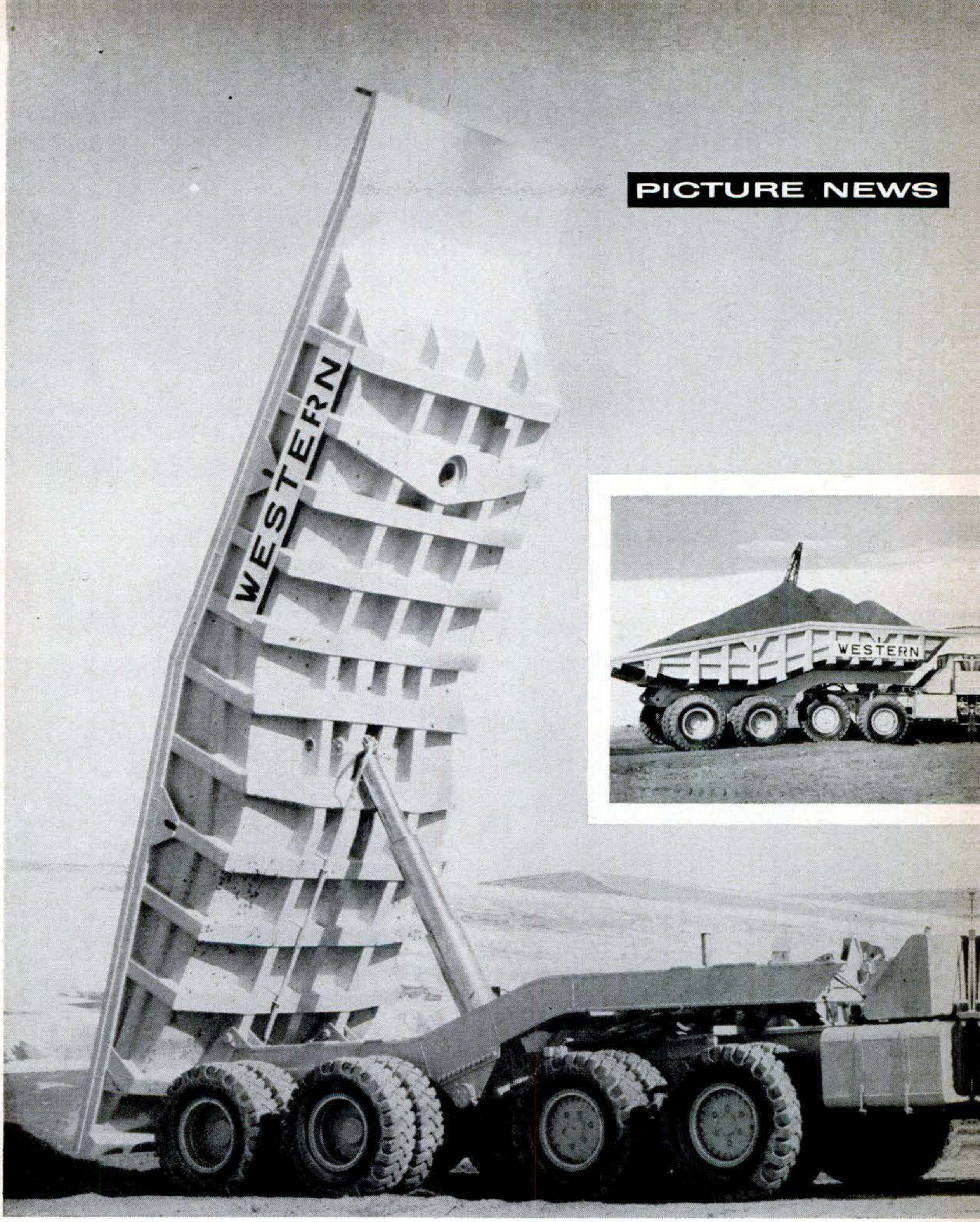

Biggest dump truck. This monster hauls more than 120 tons of earth, would handle excavation refuse from an average house basement in two loads. The truck itself weighs 78½ tons. It's powered by two 300-hp. diesels stepped up to 375 hp. by turbo-superchargers. Charles W. Jones Engineering Co., Los Angeles, built it for work by Western Contracting Corp. of Sioux City, Iowa, on the Army's Oahe dam at Pierre, S. D.

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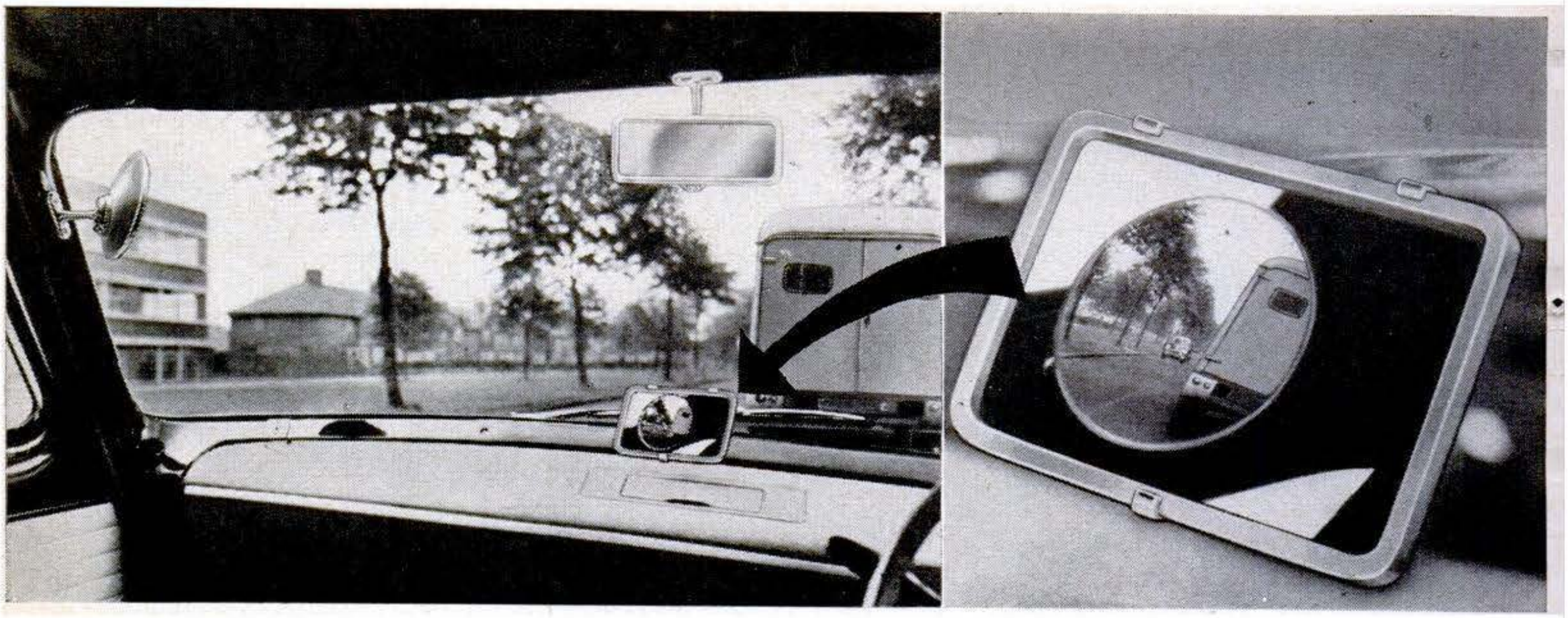
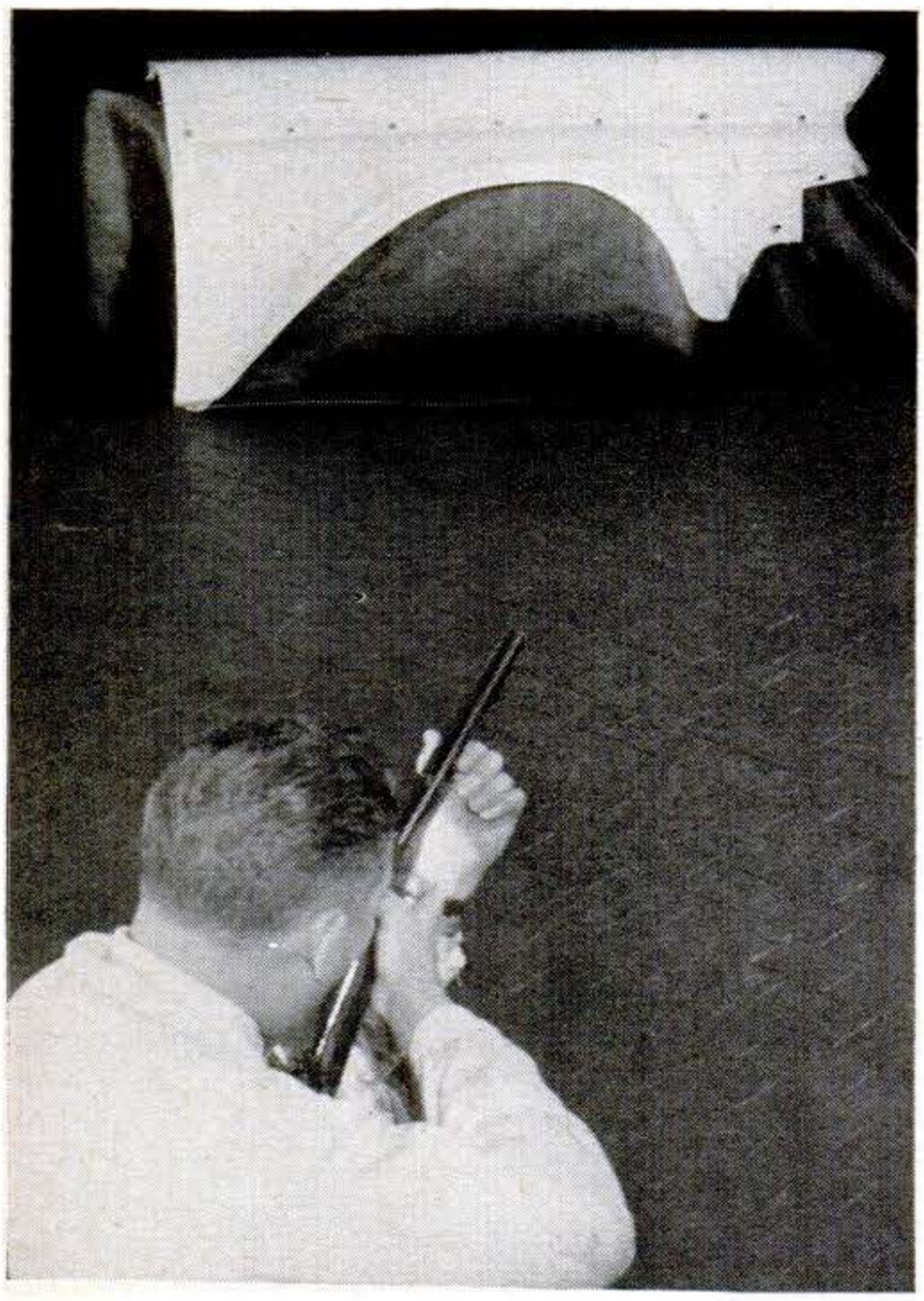


Auto driver's periscope. Ever wonder how an Englishman behind the wheel of his right-hand-drive car can see around a truck traveling on the right of a highway on the Continent? He can do it with a set of periscope mirrors made by a British firm. A flat rectangular one near the bottom of the windshield picks up the reflection from a circular convex partner high on the left post of the windshield.



BB shot tests paint job. If the paint on this fender stands up under pellets fired from an air rifle, chances are it won't be chipped by flying stones and gravel on the road. Ford engineers use this method to test finish of primer enamel.

Jet pilot wears spurs. These jet spurs clip to the floor of the downward-ejection seat of the Lockheed F-104 Starfighter to keep a pilot's legs from thrashing when he bails out at twice the speed of sound. He wears elbow clamps, too.

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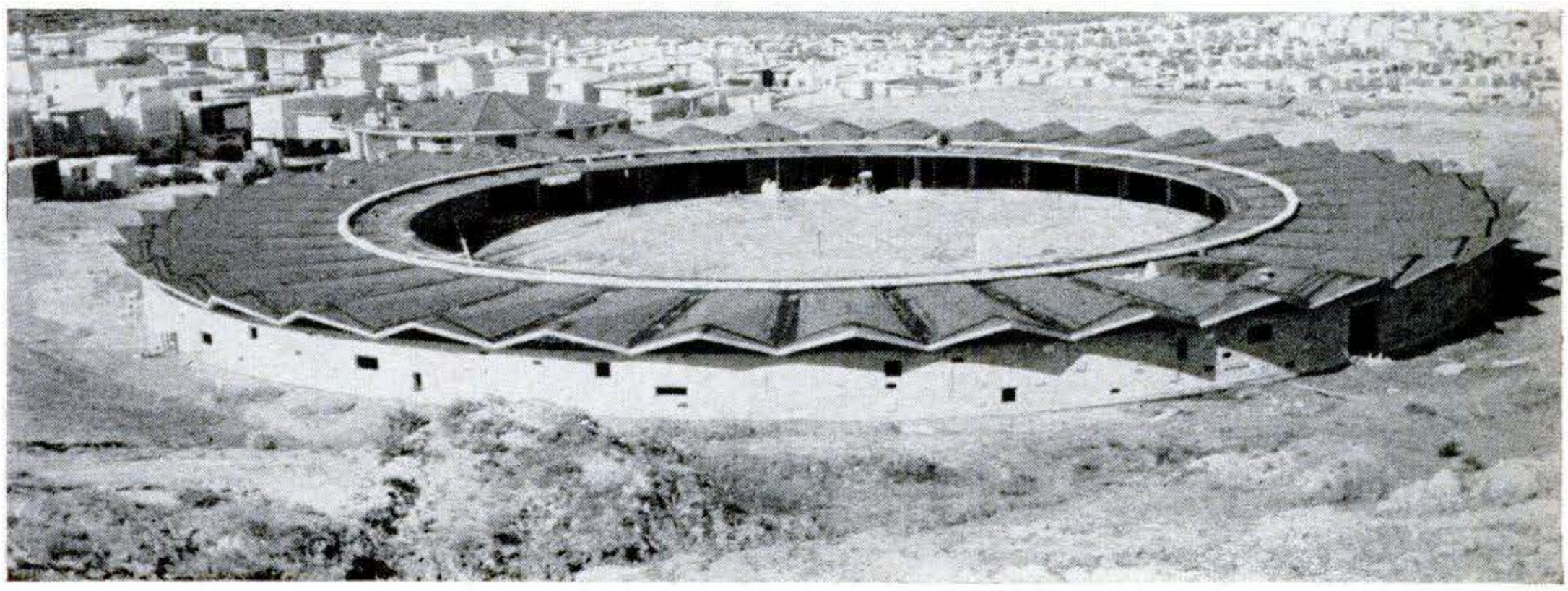
To warn of approaching missiles? This antenna dish is part of a new system the Army hopes will help put the finger on ICBM missiles. Aircraft-detection radar is useless against the high velocity and unusual configuration of missiles. The new apparatus, developed at the Cornell Aeronautical Laboratory, uses a special microwave generator and transmits radar-like signals at a peak power of 21 million watts.

School built in circles. This unusually shaped school at Daly City, Cal., is made of glass and concrete blocks and contains 15 classrooms, all with outside exposure. The inside area will be landscaped for a playground. The smaller round building in the background has glass walls and is used for school assemblies. A breezeway connects it with the main building.



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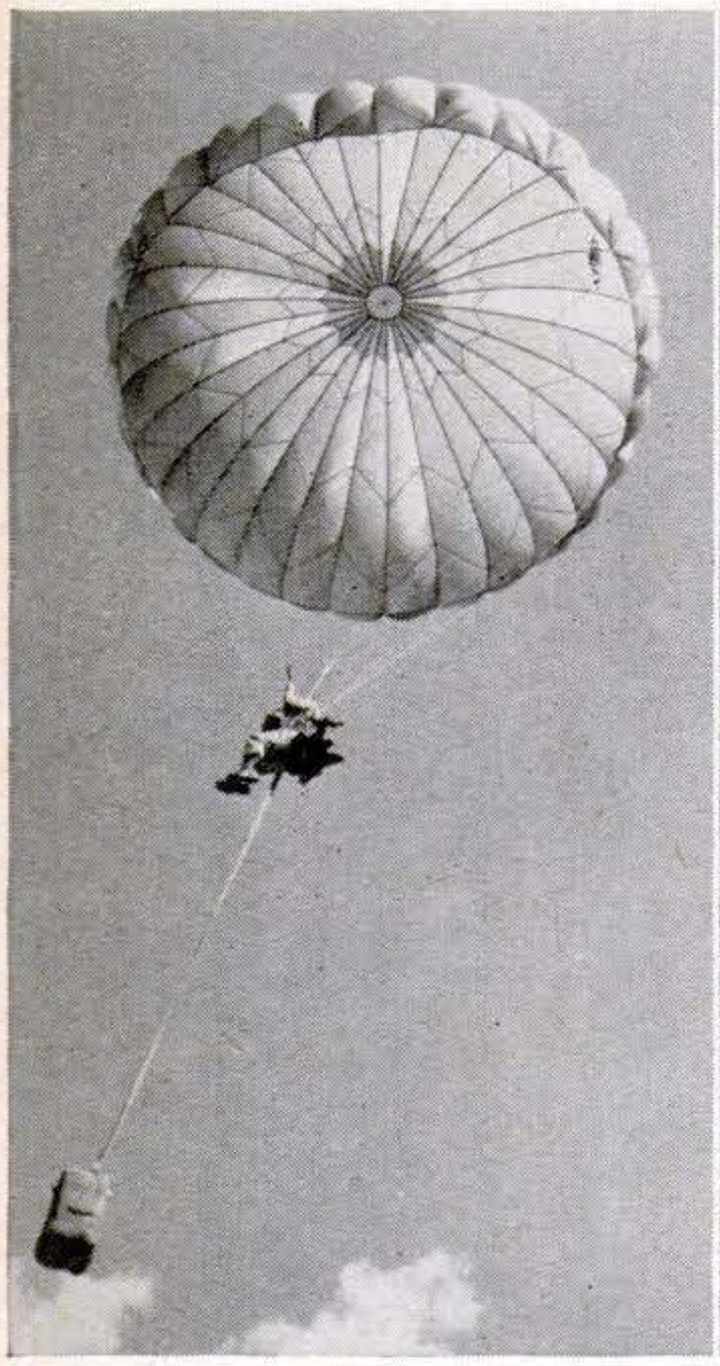
Little turbojet starts big ones. Boeing uses this truck to get a large volume of air in a hurry to start the big JT3C-4 engines of its 707 jet airliner. Needed air is supplied through the hose by a compressor driven by a smaller jet—Boeing's 210-hp. 502-11B. The stack on the top of the truck contains a muffler to quiet exhaust from the little turbine.



Marine pathfinders mark landing field. Brightly colored nylon pylons are used by this leatherneck, member of a parachute pathfinder platoon, to mark landing zones for assault troops that will follow in helicopters. At left, one of a team jumps from a reconnaissance plane with a bag of markers and other equipment hanging on a line below him.

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From dizzy heights. This highly modernistic fan-shaped spiral whirls from the top of the United Nations Educational, Scientific and Cultural Organization building now being completed in Paris. The artistic flow of the architecture sets the tone even for the fire escape. If you try it, after the building is inaugurated this year, watch your step coming down.

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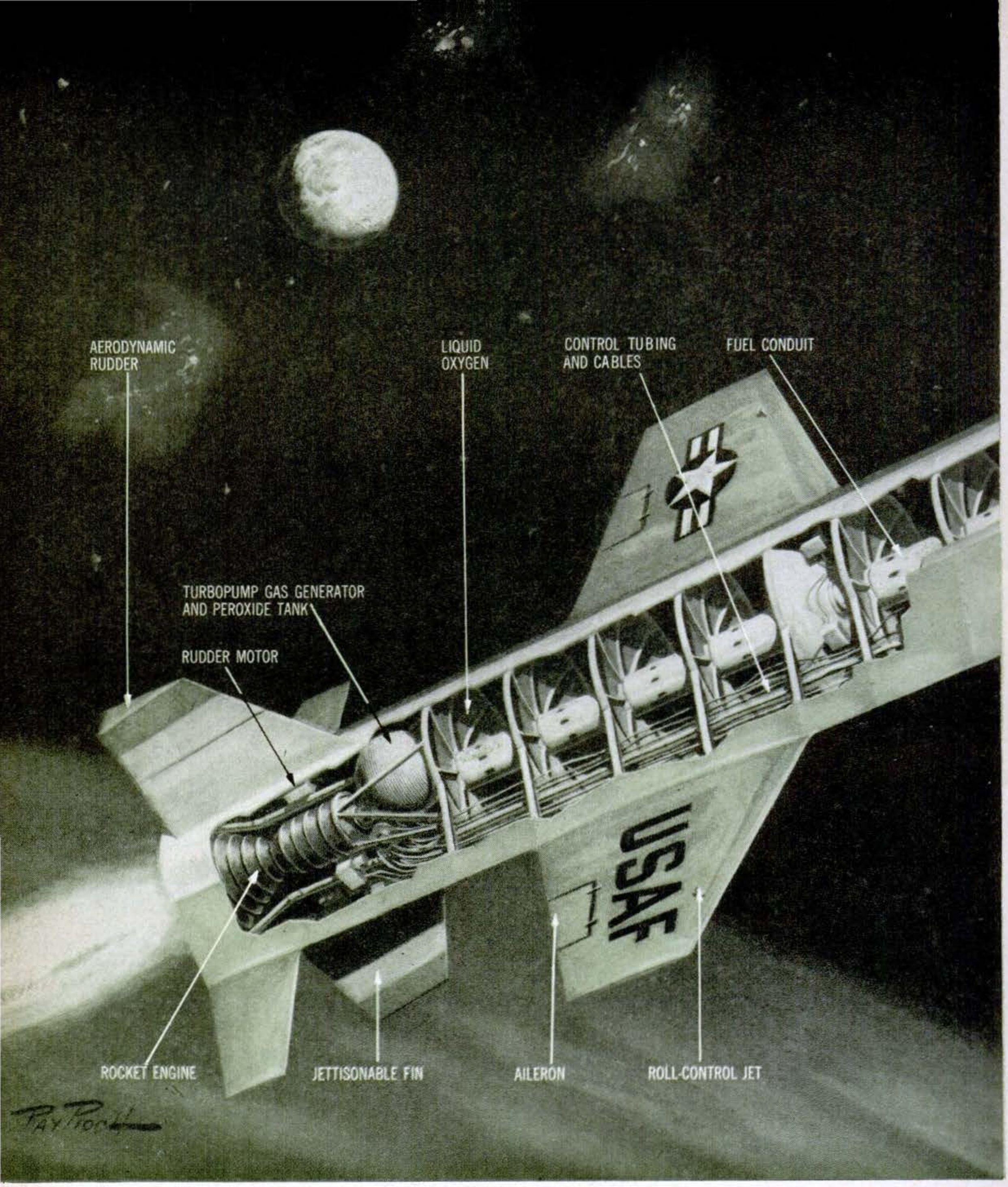

A stubby-winged "missile with a cockpit," the X-15 will take its pilot to the edge of space—and open a new era of flight

By Wesley S. Griswold

THE most extraordinary airplane in the U. S., and probably the world, is now taking shape in a closely guarded Los Angeles factory.

The X-15 is a research craft as far in advance of today's hottest fighters as they, in turn, exceed the Wright Brothers' powered box kite. It is intended to fly *scores of miles* higher and at least 2,000 m.p.h. faster than any plane now in the

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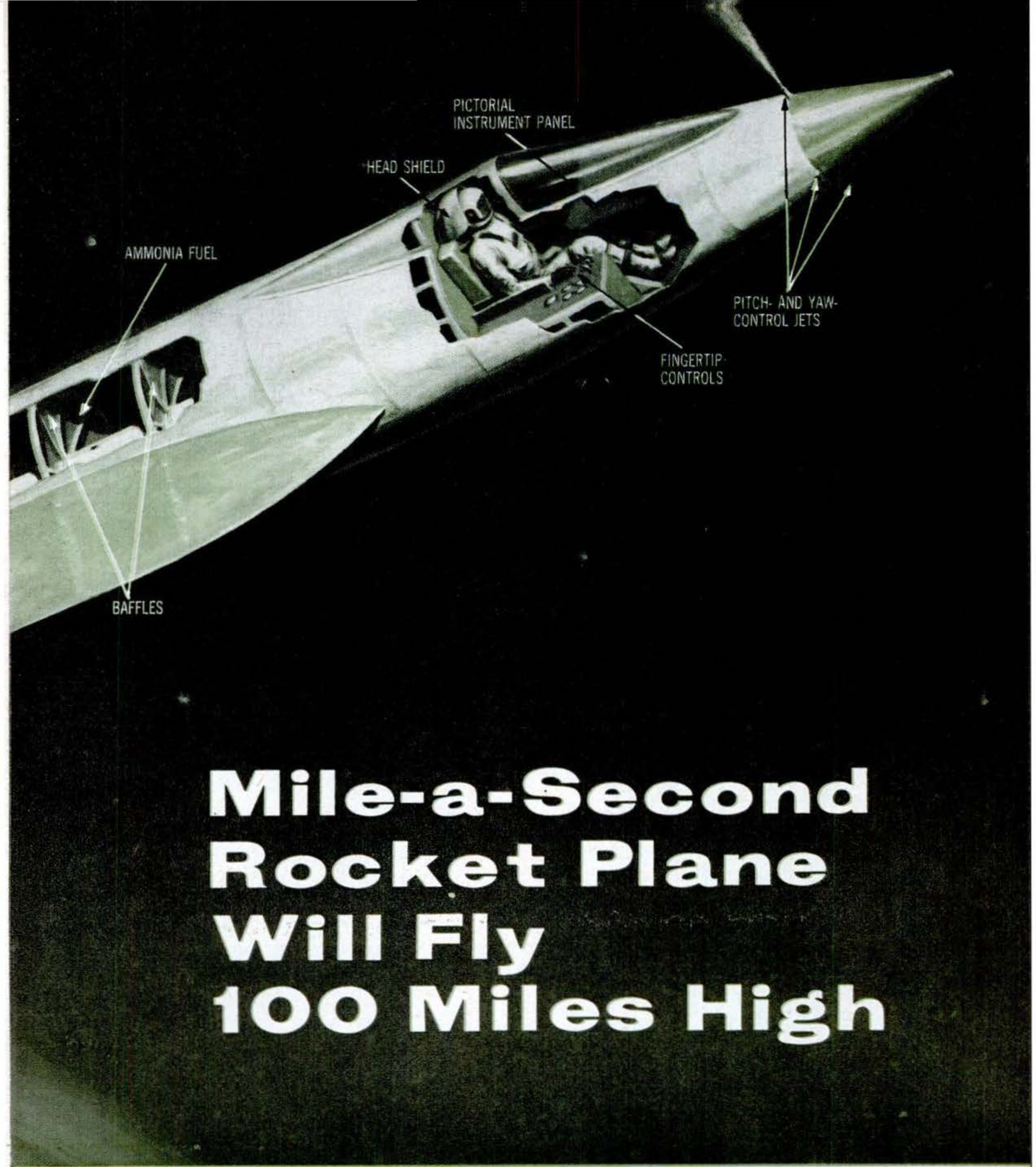

Mile-a-Second Rocket Plane Will Fly 100 Miles High

sky. The men who first fly it will take a tentative dip in the mysterious sea of outer space before future men plunge in.

Still months away from trying its stubby wings, the revolutionary X-15, a manned rocket ship, has already stirred international excitement.

It has been grandly heralded as "a steppingstone to the stars." But the men who designed it, the technicians who are building three of it, and the test pilots at Edwards Air Force Base who will find out just how high and how fast it can go have less poetic names for this up-and-coming wonder. They call it "the flying fuel tank" or "the missile with a cockpit."

Only one official statement has been made so far about what the X-15 will do,

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but that is astonishing enough. Secretary of the Air Force James H. Douglas told a Congressional committee that the experimental plane—being built by North American Aviation, with vital research help from the National Advisory Committee for Aeronautics (NACA), and with Air Force and Navy advice—should be able to fly faster than 3,600 m.p.h. (a mile a second) and higher than 100 miles. Various aeronautical engineers have predicted that its top speed will be at least 4,000 m.p.h. and its maximum altitude 300 miles. If booster rockets were added, some say it could even be made to orbit the earth for a few turns.

For a plane supposedly as secret as one diplomat's true opinion of another, the X-15 is already known in remarkable detail. Among the specifications that have leaked out, and have not been denied, are these:

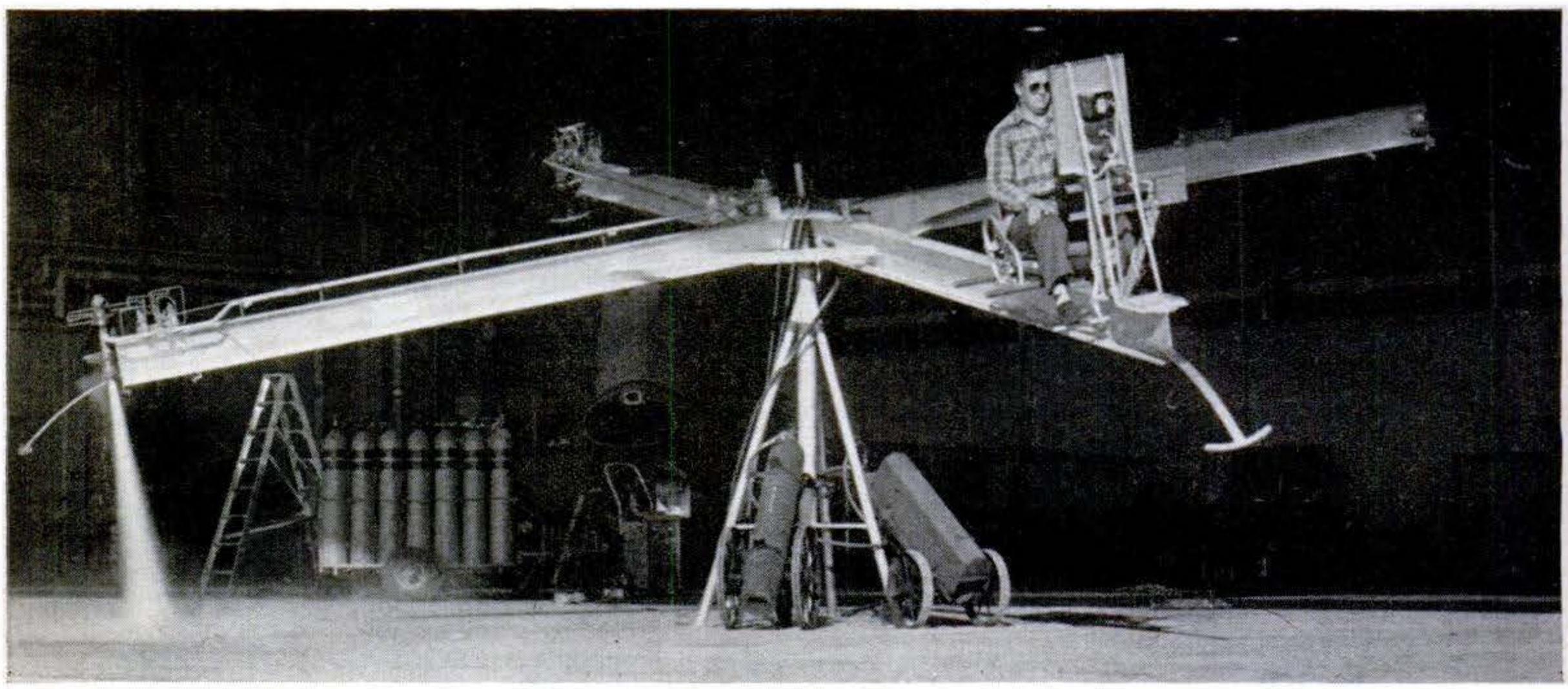
Essentially, it will be a winged tube of stainless steel, 50 feet long and not much more than four feet in diameter, with a sharply tapered nose and a rear end as blunt as a sawed-off pipe. With a full load of fuel, it will weigh around 33,000 pounds.

The pilot will sit in the plane's nose, behind a long, sloping windshield of tinted glass. To the sides, he'll have only narrow, rectangular windows to peer through.

His torso and legs will be firmly strapped to protect him from injury in case of violent buffeting and to keep him from floating when his craft zooms into the forbidding realm of zero gravity. His helmeted head will be partially surrounded by a wide, curving metal shield to prevent rough side movements. His arms will lie in metal troughs and all the necessary controls will be worked by movements of his wrists, so that he won't have to reach for anything during the eerie moments of weightlessness. There won't be any "joystick" in the X-15.

The rocket ship's cockpit will, of course, be pressurized. It will also be lighted artificially, according to Scott Crossfield, slim, short North American test pilot-engineer, who will put the X-15 through a relatively modest range of its paces (up to 100,000 feet and probably 2,000 m.p.h.) before it is turned over to the Air Force. That will enable the pilot to see his instruments clearly at the miles-high summit of the plane's climb, where, with no atmosphere to diffuse the sunlight, there will be almost no gradation between brightness and darkness.

Slightly more than half the body of the X-15 will consist of two oblong fuel tanks, laid end to end. One will contain anhydrous ammonia; the other, liquid oxygen. A fuel pipe a foot in diameter will run all the way through both tanks and



TRAINING MEN TO FLY in airless space is the job of this high-altitude flight simulator at Edwards Air Force Base. The steam jet at far left shows how reaction controls will stabilize and steer the revolutionary X-15 at altitudes where lack of air makes ailerons useless.

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lead back to a turbopump, which will feed the single, lightweight, enormously powerful rocket engine.

The engine, designed and being built by Reaction Motors, Inc., will develop 60,000-lb. thrust—more than half as much as do all eight jet engines of the B-52 from which the X-15 will be dropped, at 35,000 or 40,000 feet, to begin its thundering climb into regions where man has never ventured before. This single engine will consume thousands of pounds of fuel at such a prodigious rate that the X-15's powered flight in an all-out climb cannot last more than six minutes. But by burnout time, its momentum will be great enough to carry it many miles higher before the pilot guides it over an invisible hump in space and noses it downward for a tremendous, hypersonic slide back into the earth's thickening atmosphere.

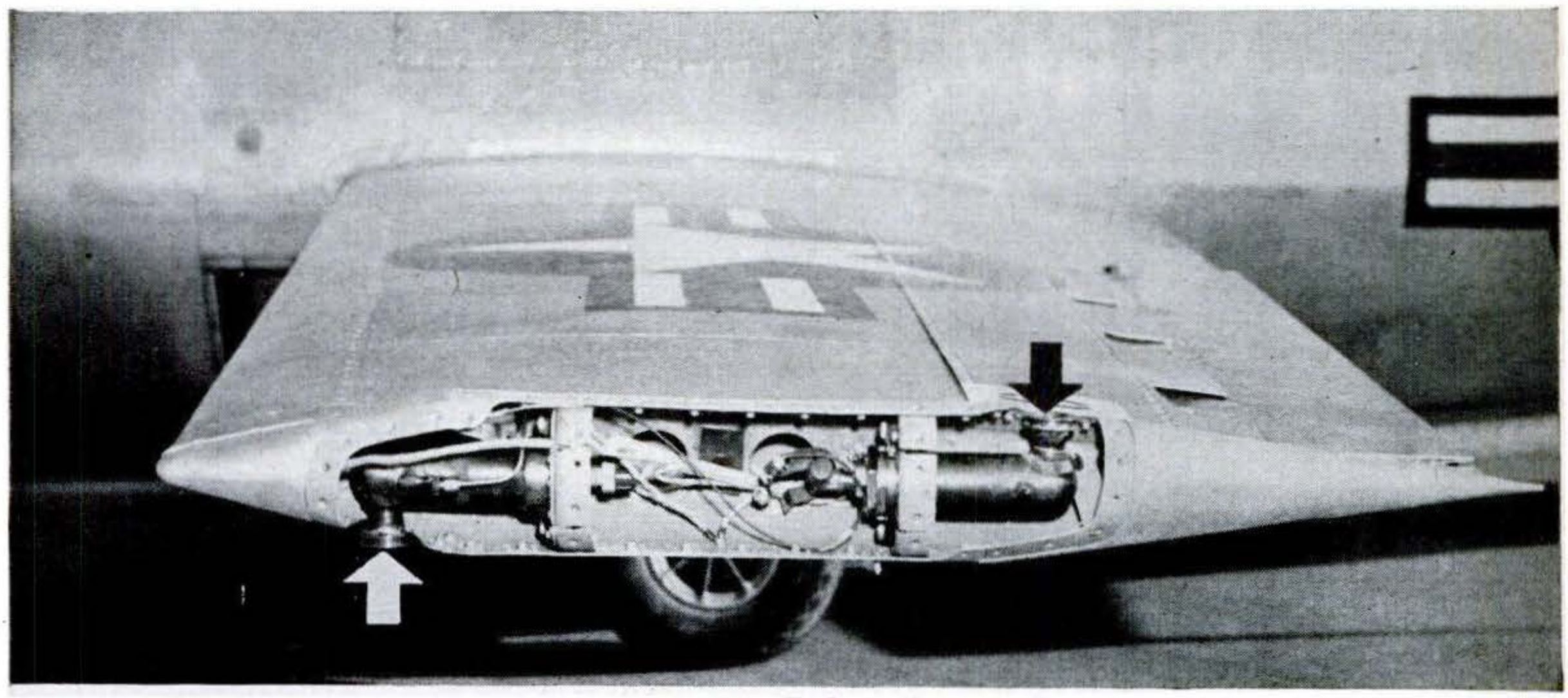
There will be roughly triangular bulges extending along the sides of the rocket ship from just behind the cockpit to the tail of the plane. They will carry essential pipes and cables around the fuel tanks, but they have another important purpose. Straight out through them, well to the rear of the fuselage's midpoint, will extend the X-15's short, square-tipped wings. The triangular bulges between fuselage and thin wings will help to lessen the terrible clawing, superheating forces of atmospheric drag that will try to tear away or melt the wings during the plane's fantastically fast descent.

Though partially protected by the unusual streamlining, these surfaces are expected to heat up momentarily to at least 1,000 degrees F. To offset this, they will be given a skin of heat-resistant nickel alloy. The heat that soaks through this armor will meet titanium and stainless steel on the inside.

The X-15's tail will be a curious sight. It will have two vertical control surfaces, one above and one below. Each will be wedge-shaped, flaring from a narrow leading edge to a trailing edge a whole foot thick. The top half of the upper one can be turned to help steer the plane while it is in atmosphere. The lower one, called a ventral fin, will be fixed. It will help steady the craft in flight but will be dropped off before the plane glides in for a landing—on skids; it will have no wheels.

The horizontal stabilizers will droop 15 degrees below true horizontal.

Undoubtedly the most novel aspect of the X-15's design is this: It will have two sets of flight controls. There will be ailerons, elevators and rudder for travel in the lower regions of the atmosphere, but there will also be strange, new steam-jet controls for those awesome heights at the top of the X-15's climb, where 97 percent of the atmosphere will lie below it. Here



EXPERIMENTAL REACTION CONTROLS installed on the X-1B above were effective at 70,000 feet. A stick in the cockpit triggers short bursts of steam from either the upper or the lower jet nozzle (arrows). The X-15 will have only up-thrust jets, one on each wing.

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FIRST MEN IN SPACE via the X-15 will be Joseph A. Walker, left, 37-year-old chief research pilot of NACA, and USAF test pilot Capt. Iven C. Kincheloe, 29 (right), who set present 126,200-foot altitude record in the X-2.

—where ordinary flight controls would be useless—some dependable way to exert controlling forces on its wings, nose and tail is needed, to enable the X-15 to re-enter the atmosphere head-first and at a very flat angle, close to the horizontal.

The way that has been chosen to accomplish this trick involves the use of small jet "engines," flush-mounted in the wings and nose of the plane. Behind the mouth of each jet will be a little cylinder containing a silver-mesh screen. High-test hydrogen peroxide from a cylindrical tank in the tail of the plane will flow into these cylinders when the pilot moves certain levers. The instant that the peroxide hits the silver screen, which is a catalyst, it will decompose into superheated steam. The force of the steam can be adjusted in advance to provide the desired thrust.

There will be an upturned jet two feet inboard from the tip of each wing, to push one side or the other down as needed. Another pair of jets, one on top of the nose and the other on the bottom, will force the nose down or up. Two more jets, on opposite sides of the nose, will govern turns.

These reaction controls, as they are called, have been tried out successfully many times, up around 70,000 feet, on a specially rigged X-1B at Edwards A.F. Base.

"They feel a little mushy but they work fine," reports Joseph A. Walker, 37-year-old chief research pilot of the NACA High Speed Flight Station at Edwards. "What's hardest to get used to is the fact that we get fixed thrust. We can't control the amount of it in flight so we get our results by controlling the length of time we use it."

The X-1B, an earlier research airplane, was not designed to use such futuristic controls, so the installation of them in it has been at best a crude approximation of the system that the X-15 will have built into it. A means of finer handling will doubtless be worked out for the X-15 in its upper altitudes. One way often mentioned is to use opposite jets simultaneously, balancing the thrust of one against that of the other.

Since conventional aircraft navigational instruments won't work dependably at the extreme heights and speeds of which the X-15 is capable, the research plane, like most missiles, will be equipped with inertial guidance. Though the exact instrumentation hasn't yet been decided upon, the guidance system will provide the pilot with a three-dimensional plot of his position in space. In addition, he'll be shepherded by radar watchers on the ground along a heavily instrumented, 450-mile range between Wendover A. F. Base, near Salt Lake, and the famous dry-lake landing field at Edwards A. F. Base, northeast of Los Angeles. All X-15 test flights will take place over this $2,000,000 range.

The pilot of the X-15, who will be dressed in a new-type pressure suit with a glistening, aluminized outer layer to reflect the sun's heat, and wear an improved helmet resembling a deep-sea diver's, will really look like a space man. Crossfield, who had a hand in design-

[Continued on page 206]

Next Month: Rascal—the answer to a bomber crew's prayer

Somewhere over the New Mexico desert a U. S. Air Force Stratojet dropped a huge pink object. Minutes later—75 safe miles away—the bombardier pressed his dump button and the pink bird screamed down to wipe out an "enemy airfield." Read "Bomber-Launched Missile Packs Nuclear Punch" in July PS.

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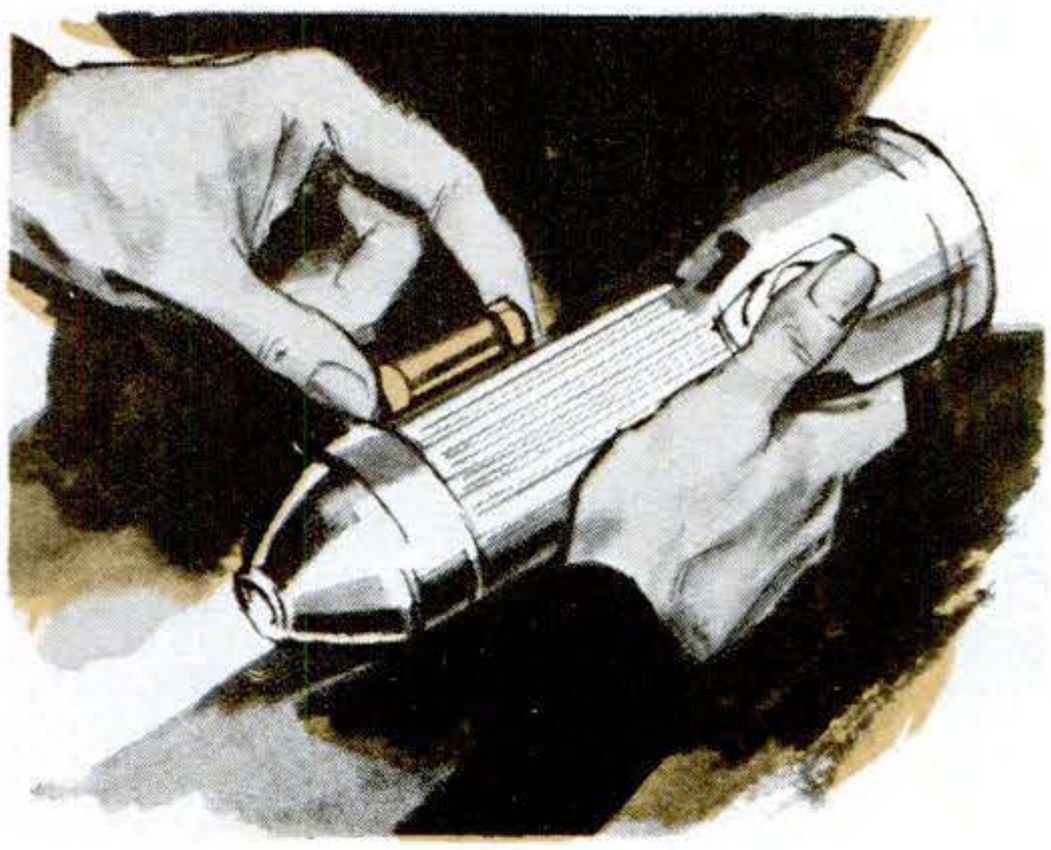
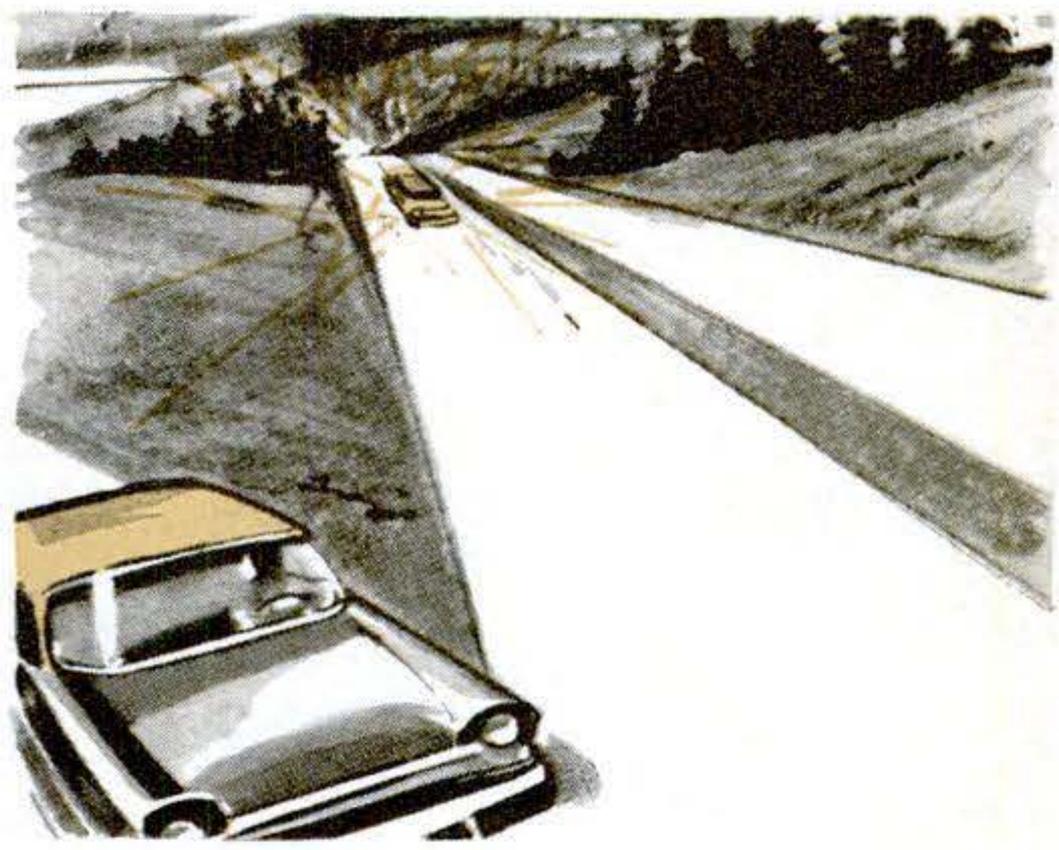
New Ideas from the Inventors

1 Floating House Covers Boat. This recently patented shelter would protect small boats from both the elements and intruders, while providing a convenient mooring. The towable, offshore-anchored dock might widen an owner's choice of camp sites since he'd be less limited by tides, traffic, or shoreline conditions.

2 Flashlight Tests Circuits. A second bulb and a set of contacts would let you use this flashlight as a continuity checker without interrupting its beam. For convenience when both tester and a light are needed most, the contact clip would fit most plug and cartridge fuses.



3 Speed Controls Horn's Loudness. This Chrysler patent would use the speed-responsive governor of an automatic transmission so that pressing your horn button would blow a loud horn when you travel at turnpike speeds and a low-volume one at slow, city speeds.



Please turn the page for more new ideas

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4 Case Times Your Smokes. This memory aid might help a smoker who wants to cut down his consumption but keeps lighting up without thinking. A timer lock on the lid would dole out single cigarettes, held in cell-like compartments in the case, at preselected intervals.

5 Outboard Cuts Weeds. By substituting this vertical-shaft mower for an outboard's prop, you could use the motor's power to chop underwater stalks. It could be used for preseason clearing of favorite channels, or attached when needed to combat prop-fouling weeds.

6 Rack Streamlines Roof Luggage. An enclosed rooftop carrier like this might be handy on family vacation trips when people fill the inside of a car and baggage overflows the trunk. The locked cover would eliminate tie-downs, keep roof-carried articles from blowing off, and protect them against weather and thieves.

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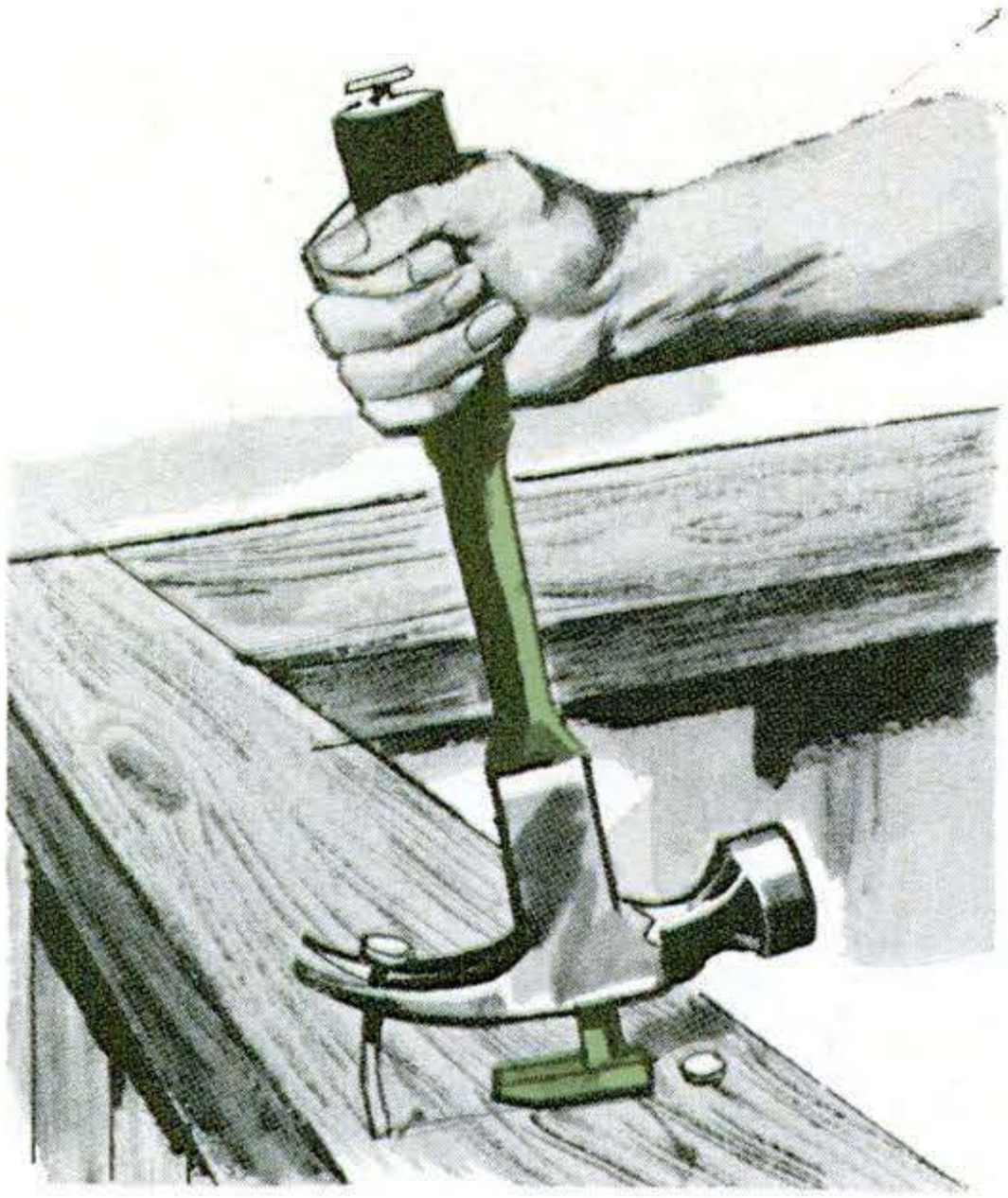
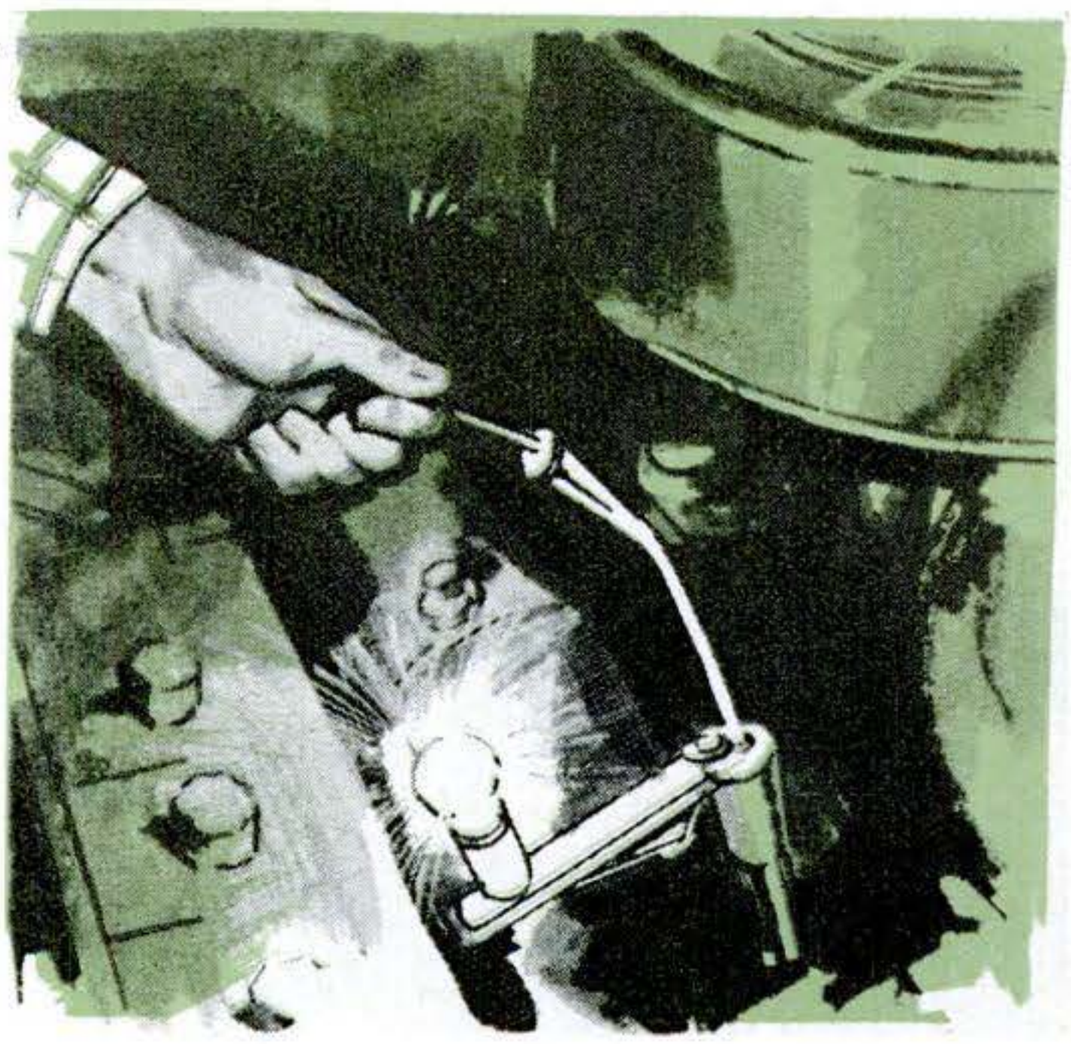


7 Hammer Blocks Itself. To give a claw hammer more nail-pulling power—and let you vary its leverage—this inventor would insert a built-in, spring-extended block in the head. A button in the handle would lock the block at the best distance from the hammer head for each job.

8 Dipstick Turns On Light. A switch and lamp holder fitted to the mouth of a dipstick socket would make it easier to check oil level at night and to reinsert the measuring stick without scooping grit into the crankcase. The spring switch would turn on the light when the stick was lifted, and turn it off when the collar was pressed down all the way.



9 Compass Glow Guides Swimmer. A flashlight bulb in this wrist compass—and a pivoted, magnetic compass card with a north-pointing slit—might help a skin-diver stay on course. When the slit came into alignment with a plastic rod that glows when illuminated, the direction signal could be seen at arm's length.

The following patents *have been issued on these inventions: 1. Patent No. 2,744,483 to Walter H. Rhindress, Braintree, Mass.; 2. No. 2,742,607 to James P. Ryan, Buffalo, N.Y.; 3. No. 2,802,197 to Howard E. Weiss, Oak Park, Mich.; 4. No. 2,812,851 to William O. Kinnebrew, Winter Haven, Fla.; 5. No. 2,739,435 to Joseph H. Wiser, Romeo, Fla.; 6. No. Des/150,087 to William E. Martin, Kewanee, Ill.; 7. No. 2,741,456 to Carl W. Williams, Modesto, Cal.; 8. No. 2,743,352 to Elma W. Gilbert, Philpot, Ky.; 9. No. 2,803,068 to Russell I. Mason, Mystic, Conn.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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How Good Are the New Portable Air Conditioners?

Very good—if you don't expect miracles. Here's the lowdown for smart shoppers on what they will—and won't—do

By A. M. Watkins

THIS summer, for the first time, you'll be able to have an air conditioner right when you want it. At the first signs of a scorcher, you can pop down to the store, bring home a suitcase-size package, slip it into a window and be basking in conditioned comfort half an hour later. Unlike the past, there will be no waiting two weeks for delivery, no installation of special wiring, nothing to make you stop and think twice before buying—a point manufacturers have long known discourages sales.

Consumer News

The new portables are this year's biggest advance in small, light, low-cost air conditioners. They have been rushed into production by over a dozen different makers. As many as 300,000 to 400,000 are expected to be carried home this summer as the temperature soars.

What you will get is a ½-horsepower unit that weighs about 60 pounds and is about 20 inches wide, 12 inches high and 12 inches thick (which means it will neither stick in nor out of the window by very much). Prices average about $150, though some are as low as $130.

All of the new units are 115-volt, 7½-ampere models—you just plug them into an ordinary wall outlet. Total power input falls between 800 and 900 watts, a little less than for a toaster or an iron.

Some of the portables will heat as well as cool. Many of them will double as dehumidifiers. You simply take the unit down to the cellar and turn it on. Moisture removal capacity is twice that of a conventional ⅛-hp. dehumidifier.

How portable is "portable"? The new coolers are light enough to be moved around a house occasionally. They can be switched to the room of a person who is sick. They can be taken to a summer cottage. And they can be easily removed from a window for use as a dehumidifier or when you want to store one away during

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How the New Portable Coolers Compare

(All units 1/2 hp., 115 volts except as noted)

MAKE	MODEL	APPROXIMATE PRICE	WEIGHT (pounds)	COOLING CAPACITY (BTU per hour)	DEHUMIDIFYING CAPACITY (pints per hour)	COMPRESSOR PUMPING CAPACITY (cu. in. per min.)	CAN BE USED AS DEHUMIDIFIER ALONE?	CAN BE USED AS HEAT PUMP?	HAS BUILT-IN THERMOSTAT?
ADMIRAL	75L7	n.a.	67	4,200	0.80	3,202	no	no	no
APCO	W-501	n.a.	65	4,000	n.a.	n.a.	n.a.	no	no
CARRIER	51AP2-115	$150	59	4,500	1.70	3,160	yes	yes	no
EMERSON ELECTRIC	AC8-13-15P	$130	59	3,150	0.85	n.a.	n.a.	n.a.	no
EMERSON RADIO	500	n.a.	60	n.a.	1.06	3,155	no	yes	no
FEDDERS	86M-2	n.a.	67	n.a.	1.30	n.a.	yes	no	yes
	86CM-2	n.a.	65	n.a.	1.10	n.a.	yes	no	yes
KING	PO-58	n.a.	70	4,000	0.80	n.a.	n.a.	n.a.	n.a.
LONERGAN	CP5A17	$200	65	4,000	n.a.	3,250	yes	no	no
MANNING BOWMAN	MP50A17	$200	65	4,000	n.a.	3,250	yes	no	no
MITCHELL	PO5H-1	$130	62	3,100	0.70	n.a.	no	no	no
SEARS, ROEBUCK	87134*	$200	85	4,200	1.50	1,275	yes	no	no
WELBILT	8WF1	$130	62	3,500	1.20	3,200	no	no	no
	8WG2	$150	65	4,500	1.50	3,200	no	no	yes
WIZARD	6JC1810	$130	62	3,000	0.85	n.a.	no	no	no

n.a.—This information not available. *3/4-hp. unit.

Points to consider in picking a portable cooler

- *Adequate capacity.* More than 50 percent of room-cooler complaints are due to undersized units. Don't buy a unit if its capacity is rated on floor area alone (a rubbery yardstick). Make sure that the cooling requirement of your room is accurately measured and that the unit you buy has the capacity to meet it.
- *Noise.* Noisy operation is the second-biggest problem with room units. Ask to hear a unit operate before you buy. None is absolutely silent, but some are quieter than others. This is particularly important for a bedroom-bound unit.
- *Installation.* Look for two things: 1) a simple, well-designed window cradle that can be easily removed and reinstalled; 2) a tight, leakproof seal around the window.
- *Air outlets.* Look for upward-angled louvers or adjustable grilles that can be turned up. These channel the cool air up over your head and out to all parts of the room and help prevent drafts.
- *Cabinet construction.* A tight, rust-proof design is important. Look for outside louvers, angled down, to keep rain out.
- *Controls.* These should be clearly marked and easy to reach. If you want automatic operation, be sure the unit has a thermostat or can be fitted with one.

the winter. But they are *not* truly portable in the real sense of the word. Do *not* expect to be able to move one from room to room at will.

The reason is that they must stay in one place, "running all the time if you want satisfactory cooling." That is how it is put by Bob Cassatt, sales manager of York and chief of the industry-wide room-air-conditioner section of the Air-Conditioning and Refrigeration Institute. Cassatt explains that this is due to a highly important phenomenon called "storage effect."

No cooler, starting from scratch in a hot room, can be expected to give fast results. A big backlog of heat has to be pumped out of the way first. A hot bedroom, for instance, has had all day to heat up. Everything in the room is warm —not only the air, but also the walls, floor, ceiling and furniture. A mattress, for example, gets warm all the way through. Before the air temperature can be pulled down one degree, everything present must be cooled off, too. With a heavy load of stored heat, this may take hours.

Storage effect will be especially hard on the new portables. They have little extra capacity to spare. If one is bought primarily for a bedroom, it should stay there. This way, it keeps heat from building up and getting out of hand.

Storage effect is at its worst during the hottest weather. At other times an air conditioner need not run all the time. On an 85-degree day, for example, a portable

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	FAN RATINGS				POWER RATINGS			CABINET SIZE		
	Evaporator-Fan Capacity (cu. ft./min.)	Condenser-Fan Capacity (cu. ft./min.)	Fan Motor (hp.)	Speed (r.p.m.)	Amps	Watts	Efficiency (BTU per watt)	Height (in.)	Width (in.)	Depth (in.)
	170	240	1/15	1,475	7.5	800	5.25	11-7/8	16-7/8	15
	115	n.a.	1/15	1,600	7.5	n.a.	n.a.	11-3/8	18-1/2	14-7/8
	130	240	1/20	1,550	7.5	790	5.5	16-3/8	22	11
	170	n.a.	1/15	1,480	6.8	630	5	12	16-15/16	14-7/8
	135	300	1/15	1,500	7.5	n.a.	n.a.	12-11/16	21-1/16	11-1/4
	160 190	n.a. n.a.	n.a. n.a.	1,450 1,300	7.5 7.5	730 730	6.8 6.8	12-1/2 10-1/2	20 14	13 19
	n.a.	n.a.	n.a.	n.a.	7.5	n.a.	n.a.	12-3/16	16-1/2	16-1/2
	125	225	1/20	1,550	7.5	740	5.4	11-7/8	16	16
	125	225	1/20	1,550	7.5	740	5.4	11-7/8	16	16
	175	320	1/15	1,500	6.9	630	4.8	12	17	15
	125	278	1/12	3,100	7.5	850	5	11	21	12-7/8
	140 180	300 300	1/20 1/20	1,550 1,550	7.5 7.5	800 840	4.4 5.35	10-25/32 10-25/32	14-9/16 14-9/16	18-3/4 18-3/4
	135	n.a.	1/25	1,500	6.9	602	5	12	16-15/16	14-7/8

● *Filters*. Look for a filter that is easy to remove for cleaning. Dirty filters are the biggest reason for a fall-off in cooling efficiency. Most of the small portable units have a permanent mesh filter, metal or plastic. It can be used over and over again but must be cleaned regularly.

● *Dehumidifying capacity*. All air conditioners dehumidify while they cool, but some are more effective than others. High capacity is particularly important in soggy summer areas like Washington, Houston and New Orleans. Capacity of the portables in pints of water removed from the air per hour is listed in the chart. You get the same capacity if the unit is used as a straight dehumidifier.

may cool down a room in as little as 20 minutes. This is just about as fast as a regular-size unit. But remember that the unit must be big enough for the room in the first place.

Operating cost. Even when a unit runs all day, operating costs are nothing special to worry about. It takes just about as much electricity to keep a unit turned on only half of the time as all the time. The total heat it has to handle is the same. Part-time operation merely means that the unit will have to work longer to get rid of as much *total* heat.

Makers estimate that power costs for the small new portables will average about $5 or $6 a month at most. This will come to less than $20 a summer for the usual three months of summer cooling in the North, up to $40 for the five- to six-month cooling season in the deep South.

Cooling capacity. This varies according to brand. Most of the new units have ½-hp. motors and compressors. But cooling output in BTUs (British Thermal Units) per hour is far more important. It varies in most cases from around 4,000 to 4,600 BTUs.

This is enough to cool 50 percent of the bedrooms in the U.S., according to Salvatore Giordano, president of Fedders-Quigan, said to be the biggest maker of room conditioners. Giordano urges that every cooler, regardless of size, be capacity-matched to its room.

The exact capacity you need depends on the number of people using the room, the interior heat from lights and appliances, the amount of wall and ceiling insulation, and, most crucial of all, the amount of window area exposed to hot sun on the south and west. To find the total cooling load, you add up all these separate loads, as shown on page 124.

Another key fact is that too big a unit is almost as bad as one that is too small. Humidity control suffers with an oversized unit. With a thermostat, the unit will quickly cool a room, then switch off for a while. But humidity rises faster than does temperature. It will get out of hand long before the thermostat turns the unit back on, because thermostats respond only to temperature. Here again, best results occur when a unit runs all the time in hot weather.

New vs. old. How good are the new units? How come many will provide as much cooling power (4,500 BTUs) as the old-style ½-hp. room coolers which were three times heavier and 50 percent more expensive?

Answer: The big wallop of the new small models is due chiefly to their new ½-hp. "pancake" compressor—the heart of any air conditioner. The new compressor was developed after seven years of research. The whole compressor-motor unit weighs a mere 30 pounds—against 70 pounds for old-style conventional ½-hp. compressors.

The other parts in each cooler vary according to brand. Compared with former models, practically every interior part has been redesigned, shuffled around and packed together in a smaller space. A new, compact fan design is used. Cooling

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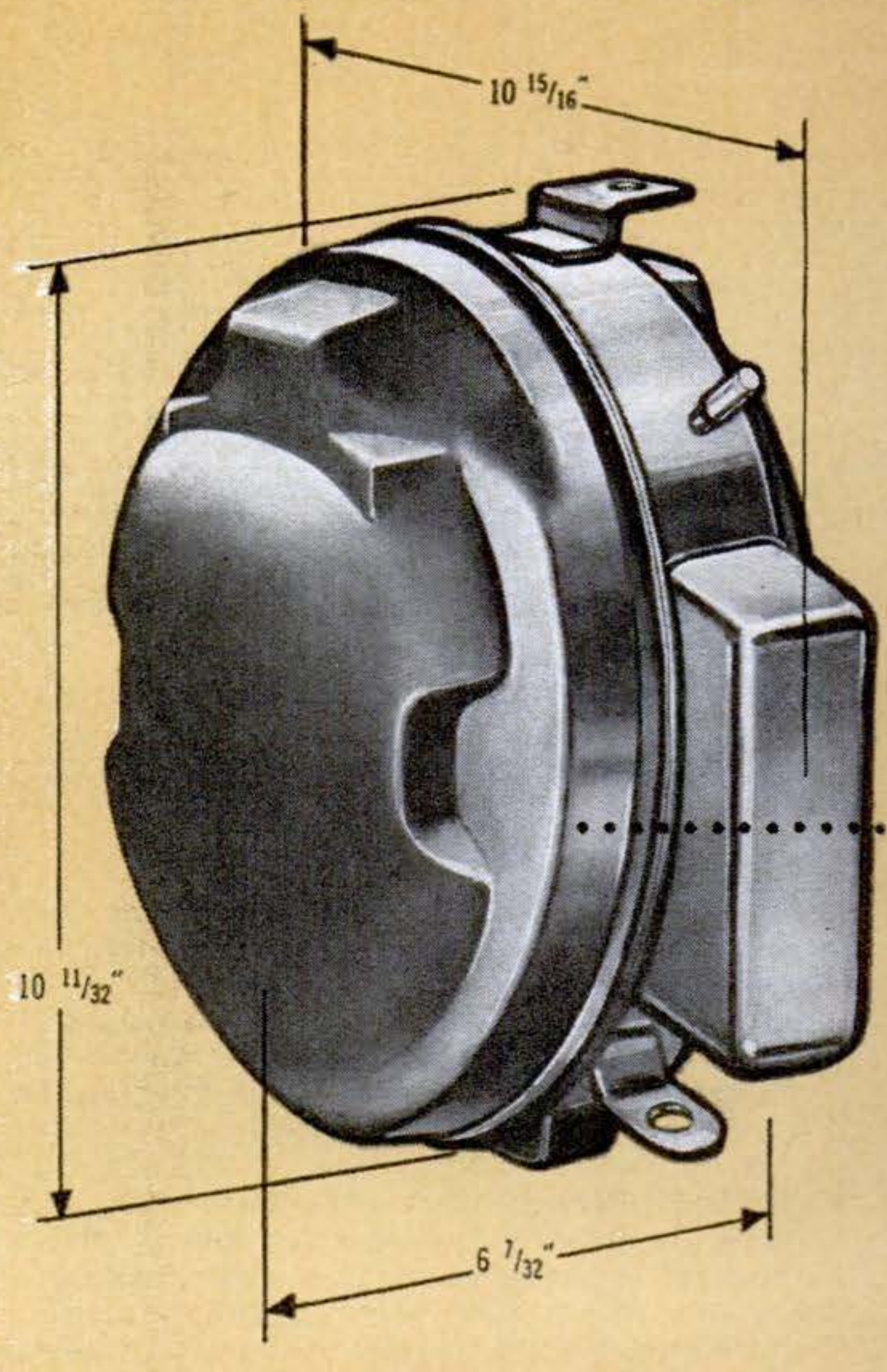
coils provide more capacity from less surface. And featherweight aluminum and plastic parts have been substituted for heavier materials.

Many engineers believe that the same lightweight techniques used in the new baby coolers will eventually catch up with larger air conditioners. Then we may see a sharp reduction in the size, weight and cost of big home air conditioners.

Automatic control. Because of the squeeze on size and weight, not all of the new brands offer such features as built-in thermostat or heater. A thermostat lets you preset the unit to a certain temperature and forget about it. This will avoid overchilling in a bedroom at night. Whether or not a thermostat is included is noted in the chart. Those makers who do not provide one hasten to say that a separate cooling thermostat can be added easily.

Heating is provided in a novel way. You turn the unit around in the window. Instead of pumping heat out of the room, the unit takes heat from the outside air and pumps it *into* the room, just the way it is done with a heat pump. Not all units, however, can pull off this trick. Those that can, have a heating capacity of 4,000 to 5,000 BTUs an hour. This is enough to provide booster heat in spring or fall but definitely not enough to replace a radiator when it is really cold.

The big shrink: Three types



New "Middleweight" Air Conditioners

NOT all manufacturers agree about the baby portables. Such firms as Hotpoint, GE, Philco, York, Amana, Westinghouse and Montgomery Ward have decided to put their money on a new slimmed-down line of one-horsepower air conditioners, instead of the ½-hp. midgets.

The result is a group of middleweight room units in the 85- to 125-pound class. They fall about halfway between the new lightweight models and the 150-pounds-and-up conventional units. They pack a cooling punch of 6,000 to 8,000 BTUs per hour. This is good enough to air-condition a moderate-size living room. (Some makers say "up to 425 square feet," but this is maximum under ideal conditions.)

The middleweights are only slightly larger than the baby portables. They too, can be lugged home and installed in a few minutes. Some are called "portable," but if you read the small print you will see that this is only if you pay $10 to $15 extra for a cart on casters. Prices range from about $225 to $275, depending on capacity and brand.

As an example, Hotpoint offers two versions of its new 98-pound, one-hp. cooler. One comes with a 7½-ampere compressor and gives you 7,000 BTUs for $229.95. The other has a 12-ampere compressor and gives you 8,000 BTUs for $249.95. The 12-amp model gives you almost 15 percent more cooling capacity for only 10 percent more money. But the 7½-amp model makes less demand on the current-handling capacity of your house wiring. It will be your best bet if your wiring has limited capacity to spare for air conditioning.

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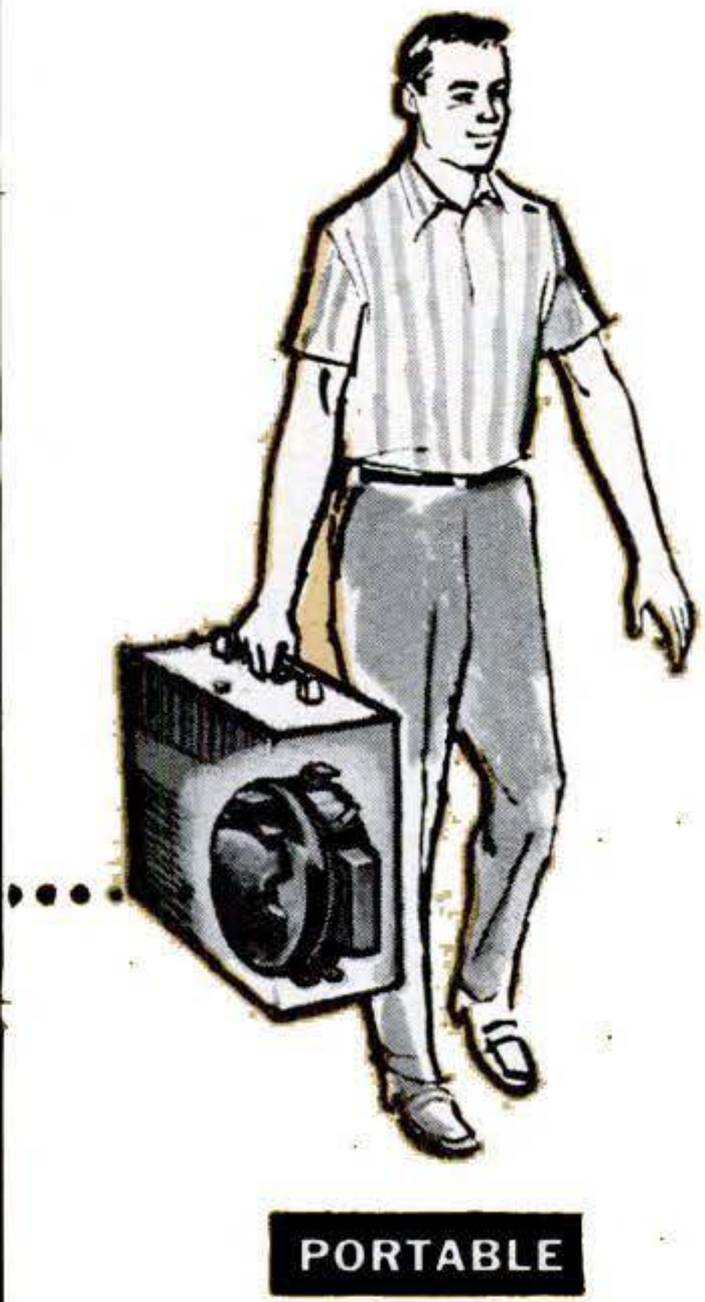
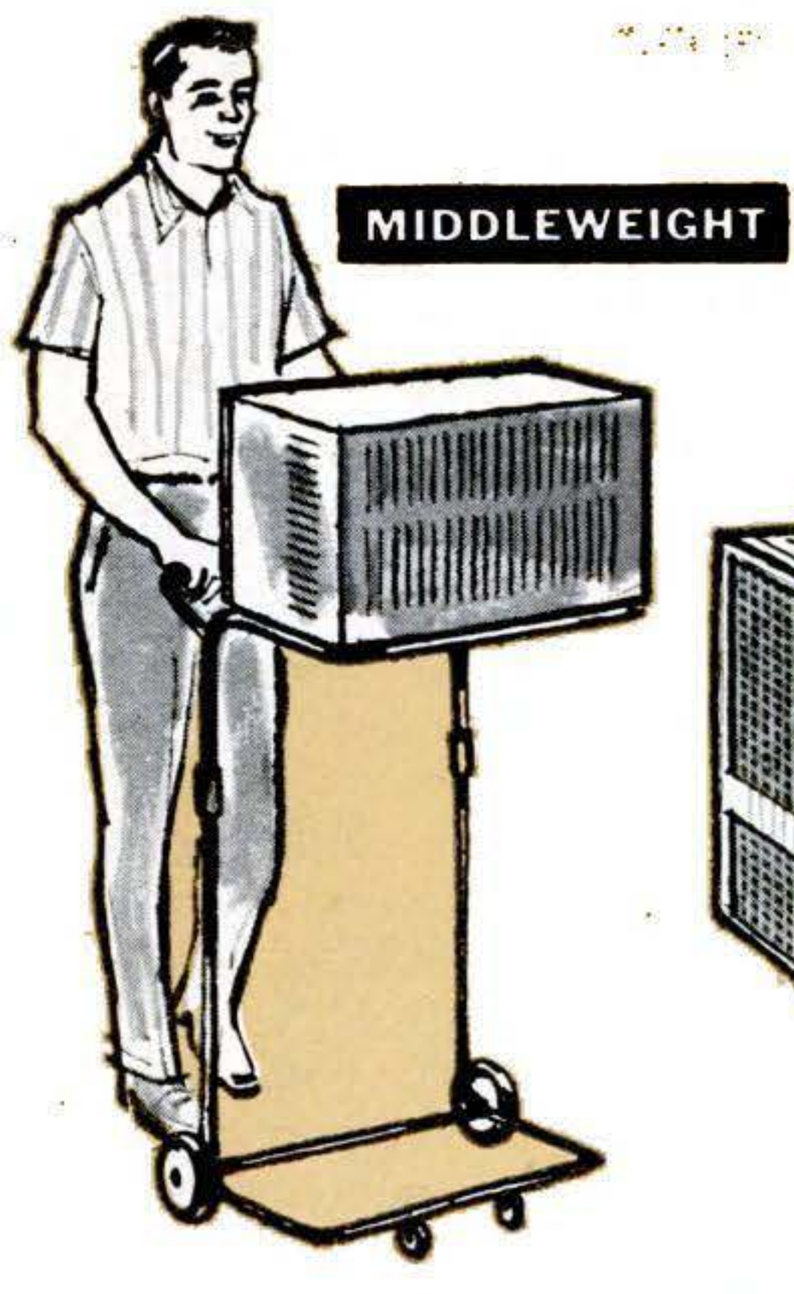
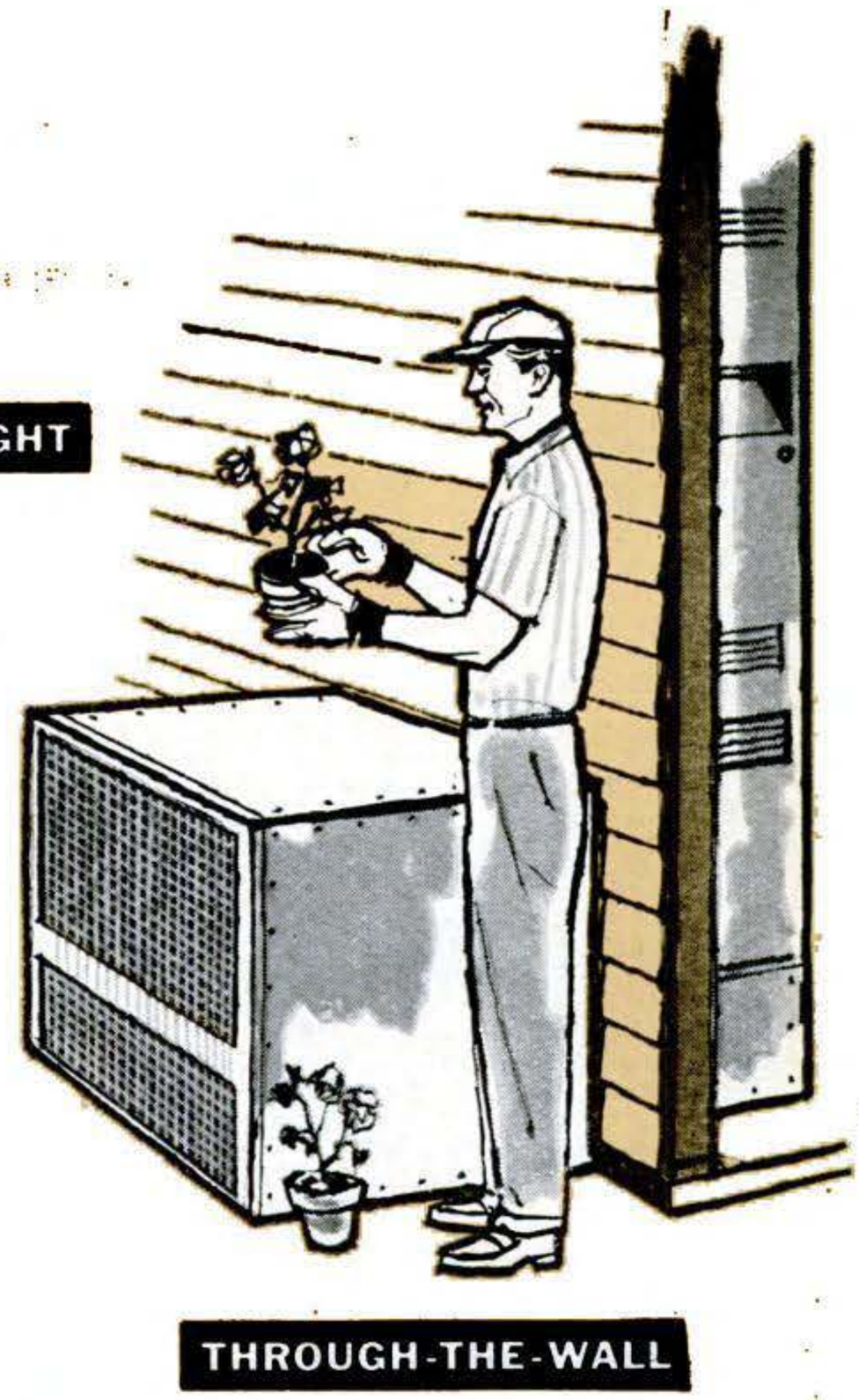
of coolers all come down in size



PORTABLE



MIDDLEWEIGHT



THROUGH-THE-WALL

SUITCASE-SIZE PORTABLE COOLERS have been made possible this year for the first time by development of compact "pancake" compressors like the one at left. Made by Tecumseh Products, it weighs only 30 pounds, is used in most of today's portables. "Middleweight" coolers are slightly larger than portables, weigh about 100 pounds, but can still be moved on a wheeled cart, as shown at center above. New "through-the-wall" central systems, at right, both heat and cool an entire house the year round, yet take no more space inside than a closet.

Are Getting Smaller, Too

The new middleweight coolers were made possible chiefly because of the development of compact new one-hp. compressors. GE engineers, for instance, came up with a remarkably small rotary compressor that's only six inches long, even including the motor, and weighs less than 40 pounds.

Few makers are introducing new ¾-hp. models this year because of a quirk in the Federal excise-tax law. A 10-percent tax is put on room conditioners up to and including the ¾-hp. size, but not on larger sizes. The tax on the ¾-hp. size just about makes up the extra cost of manufacturing a one-hp. unit. Both sizes end up on counters priced about the same. So most makers have concluded: Why bother with the smaller ¾-hp. jobs?

Conventional coolers. None of the new standard-size room coolers for 1958 is even called portable—the biggest weigh a lusty 250 to 300 pounds. Most are improved versions of their 1957 counterparts. Capacities range from about 6,000 BTUs all the way up to 20,000, prices from about $200 to more than $350. Installation will cost another $30 to $40 under most conditions.

One big advantage: Most makers offer heat-pump models for as little as $20 to $35 more than the cost of a standard model. You get a generous supply of heat, enough to warm a good-sized room, particularly in the South. But you cannot count on a full heating job during cold weather in the North. This is because heating efficiency takes a nosedive when the outside air temperature drops below 30 degrees. The colder the outdoor air, the

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How to Tell What Size Air Conditioner You Need

ROOM CHARACTERISTICS	Multiply by	Cooling Load
1. Area of windows facing:		
a. East, southeast or south: .....sq. ft.	45	
b. Southwest: .....sq. ft.	65	
c. West: .....sq. ft.	100	
d. Northwest: .....sq. ft.	35	
Compute all separate loads above, but enter only the largest load at right:		.....
2. Area of all windows not included in item 1 above: .....sq. ft.	14	.....
3. Length of walls:		
a. Facing same exposure used in item 1: .....ft.	50	.....
b. Total length of all other walls: .....ft.	30	.....
4. Area of ceiling: .....sq. ft.	10	.....
5. Area of floor (use only if over heated basement): .....sq. ft.	3	.....
6. Number of people using room: .....people	900	.....
7. Wattage of lights and electrical equipment used in room: .....watts	3	.....
8. Total width of open doors or arches (do not use if doors are kept closed): .....ft.	300	.....
Add up separate cooling loads in right-hand column and enter total here. This is cooling capacity in BTUs required to cool room:		.....

COOLING loads vary with the size and type of each room. Fill in the blanks in the left-hand column above for *the particular room where the air conditioner is to be used.* Then multiply these amounts by the numbers given in the middle column and enter the products in the right-hand column. The total amount is the cooling capacity you need in BTUs per hour.

harder it is for any heat pump to extract heat from outside.

Special features. Built-in thermostats are standard on most heavyweight coolers, as are two other good features: two-speed fan control and fresh-air ventilation.

Two-speed control gives you, in effect, a high and a low gearshift. High is for top air capacity to handle the worst dog days of summer. Low is for most of the rest of the time. Operating noise is much less when the fan is in low.

The ventilation feature is a big help in keeping a room clean all year round, especially for cliff dwellers in cities with a lot of soot and smog. Fresh outside air is pulled in, filtered, and blown into the room. Windows can be kept closed all the time, shutting out the dirt. None of the 60-pound class of portables offers either outside air ventilation or two-speed fan control. Some of the middleweights offer one or both—you have to ask to be sure in each case.

One questionable feature often advertised is the ability to exhaust stale room air. A switch lets you reverse the fan and exhaust smoke and foul air to the outside. Exhaust air capacity, however, is so low that even the makers don't promise you much. Most experts agree that the best way to clear out a room is to let the unit pull in fresh air.

New Hope for Whole-House Coolers: Cheaper, Smaller, Easier to Install

IF AIR-CONDITIONING makers get a break from the weather, a record 250,000 homeowners will put in *central* cooling systems this year. Sales last year were a disappointing 160,000 because of cool weather. But three big new developments are expected to spur sales for 1958:

- Heat pumps for year-round conditioning are down in price. They're up in sales: From only 5,000 a few years back, over 30,000 heat pumps are now in use.

Electric utilities, which see the heat pump as a way to spread summer-only loads over the entire year, are starting to offer lower rates in many areas to encourage sales. If your electricity rate is 1¾ cents per kilowatt-hour or less, cost of operation is no more than for oil at 15 or 16 cents a gallon.

- Conventional furnace-air-conditioning combinations are also coming down in size and price. New compact units mount right in a house wall and take little more space than a closet. You can buy the furnace half first, then add a plug-in air conditioner any time later. Costs are estimated to be 30 percent less than for bulky, old-style central systems.
- There will also be more money to spend on air conditioners this year. The Federal Housing Administration, which long frowned on coolers as expensive luxuries, has now relaxed its mortgage policy to favor air-conditioned houses. As one FHA Deputy Commissioner puts it: "Within a few years any house that is not air-conditioned will probably be obsolescent." This, the experts say, will mean a big boost for homes with built-in coolers. END

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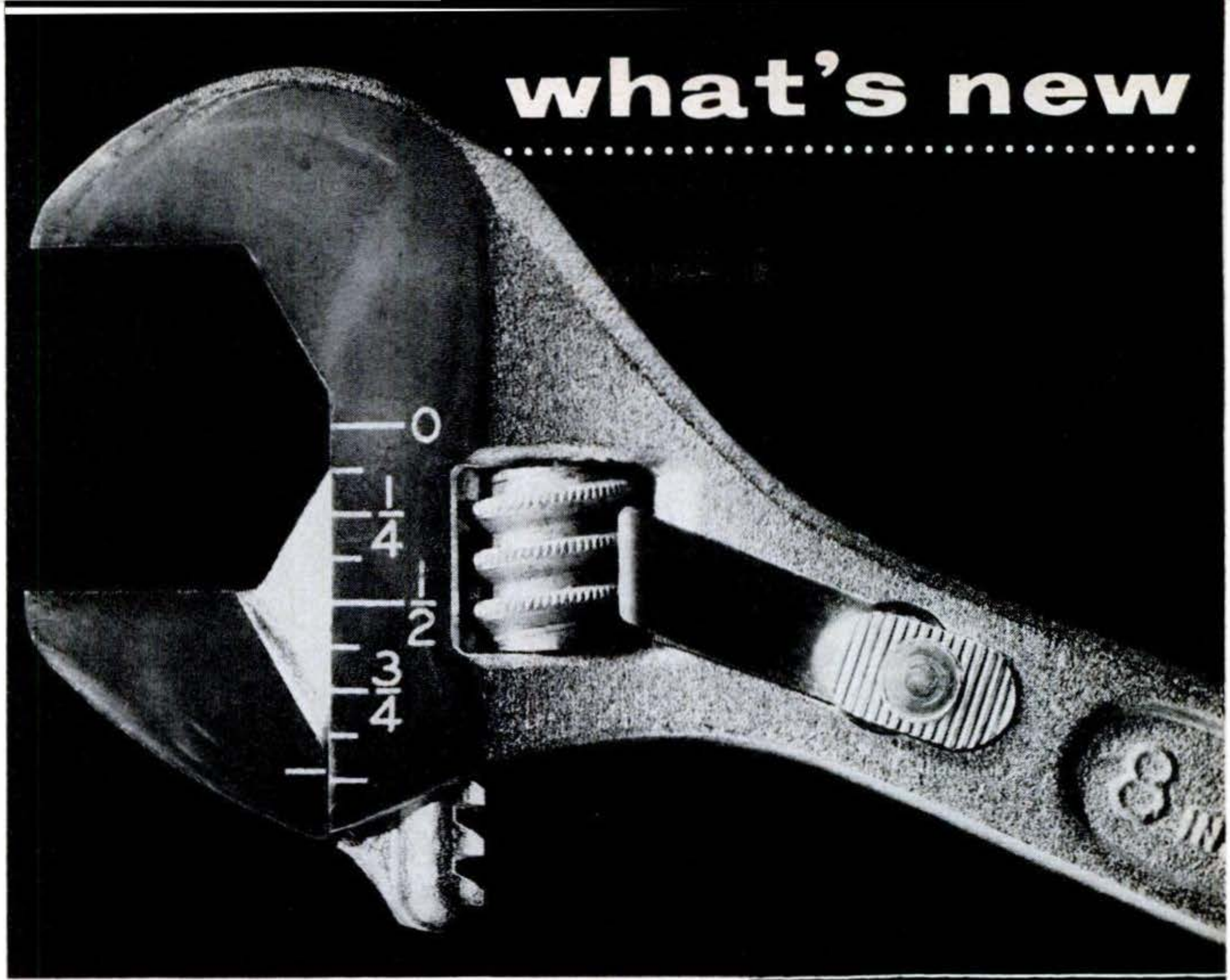
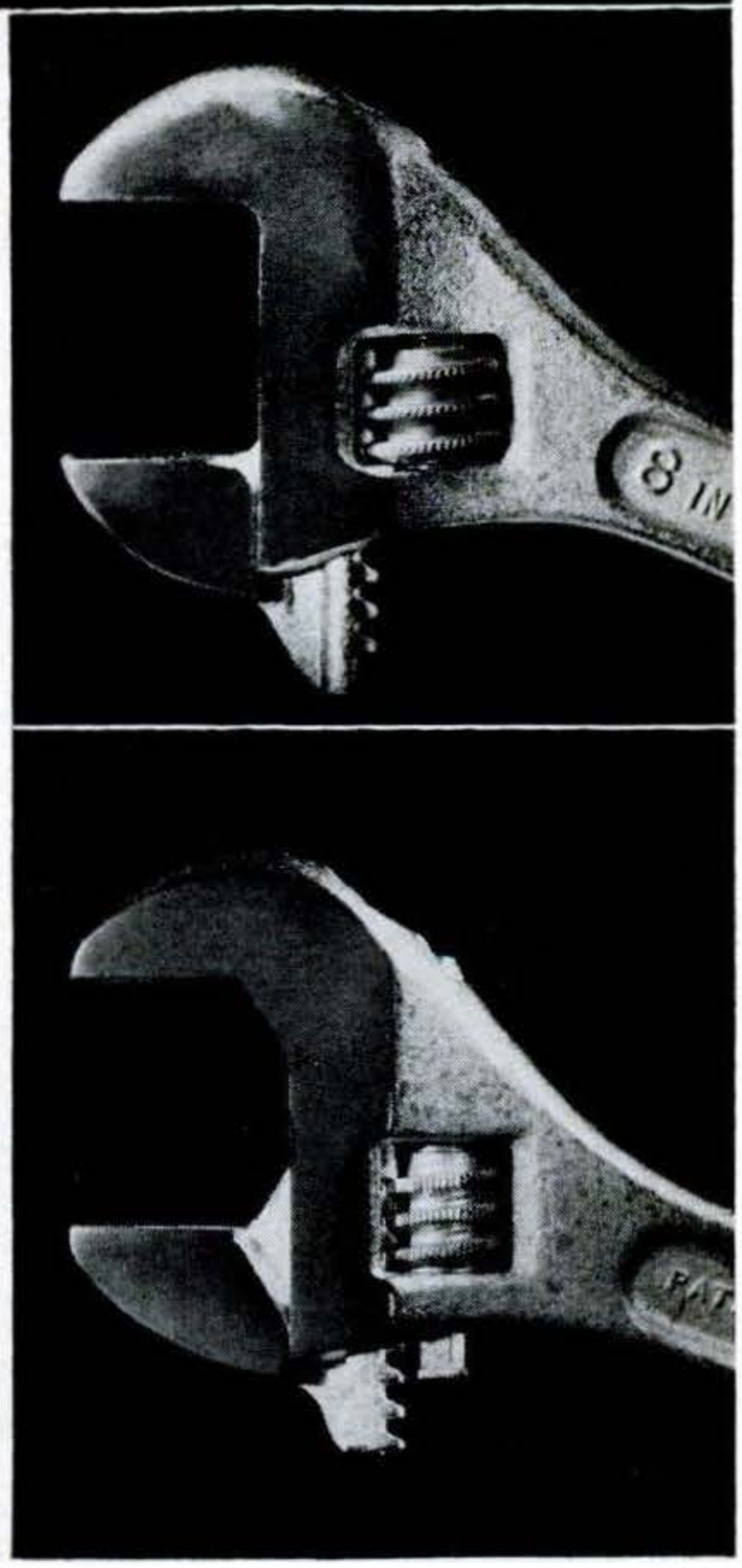
what's new



the latest in tools

Adjustable wrenches that lock where you want them are the latest development of three well-known tool makers. Once set, the jaws can't loosen, saving you bruised knuckles from accidental slips and eliminating the nuisance of constant resetting. In the Crescent wrench above, a spring leaf is pressed against the knurled adjusting wheel, preventing it from turning after the jaw is tightened. The new wrench, not yet on the market but expected in hardware stores by early fall, is also calibrated from 0″ to 1″ so you can preset it to any desired jaw width ahead of time . . . ***A second new wrench*** (upper right) uses a spring to press the knurled wheel sideways against the wrench body so it can't rotate after you set it. It's sold by Proto Tools and its subsidiary, P & C Tool Co . . . ***The third wrench*** (lower right), made by J. H. Williams, provides a similar locking action with a sliding pin through the knurled wheel. Pushing the pin up locks the wheel; pushing it down releases it. (Watch August PS for a tear-out booklet on these and many other types of wrenches for the homeowner.) . . . ***Large-size bits for electric drills*** have been developed by Stanley in a new round shape that's said to eliminate rocking and permit more accurate drilling of angular holes. They come in six sizes from 3/8″ to 1″.



More new products on the next page

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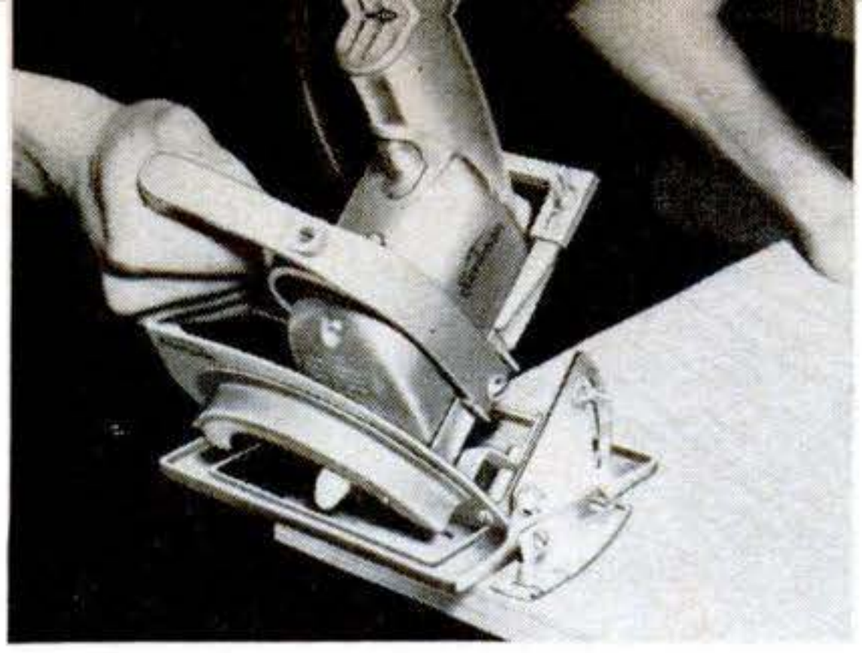

A slicked-up saw attachment for electric drills (at left) has many features of full-fledged portable saws. Made to fit Sunbeam drills, it has a retracting blade guard, tilting base for bevel cuts, depth control, and a saw guide that lines up the blade for 90- or 45-degree cuts. Priced at $14.95, it can also be adjusted to cut right on the guide line or to either side of it.

A new multipurpose screwdriver (at left) stores three interchangeable bits inside and automatically feeds a new one out through the tip as you push another one into the handle. With no bit in the tip, the driver becomes a ¼″ hex socket wrench. George Playter sells it for $2 with two flat blades and one Phillips bit . . . ***You can bore holes in concrete quickly*** with a reciprocating impact hammer that fits any ¼″ or ½″ electric drill. It takes all types of masonry bits up to 1″ for drilling, chipping, peening and hammering. Made by Hamer-Dril, it sells for $29.75 . . . ***A build-it-yourself jigsaw kit*** is available from Henlon Corp. for use with your own motor. Made of hardwood parts, the saw has a 15½″ throat, sells for $14.95.

what's new for the family car

You can add dual headlights to any '57 Ford or Chevy with a new conversion kit shown at left. The twin lamps are designed to fit under the broad "eyebrow" on the fender, giving an appearance identical to '58 cars. They mount in the same screw holes as the old single lamp and come with prewired connectors for quick installation. The C. M. Hall Lamp Co., which says the lights meet SAE standards and are legal in all states, sells the kit for $52.50.

Another dual accessory is a two-part sun visor that provides both a shade for the windshield and a second one that can be swung across the side window. Both visors can be folded up or down independently of each other. Made by the Beham Co. to fit most late-model cars, the dual shade sells for $9.95 . . . ***A portable cooler*** can be used on auto trips or at home. In the car, the evaporative-type Wright cooler plugs into the cigarette-lighter socket. An accessory transformer then converts it for use on 115-volt house current . . . ***Transmission sealer,*** made by the Radiator Specialty Co., is designed to stop leaks and provide smoother, quieter operation . . . ***Cooling fins*** to help dissipate brake-drum heat now come in aluminum strips that you can wrap around the drums. A set of four Kool-Fins costs $9.95.

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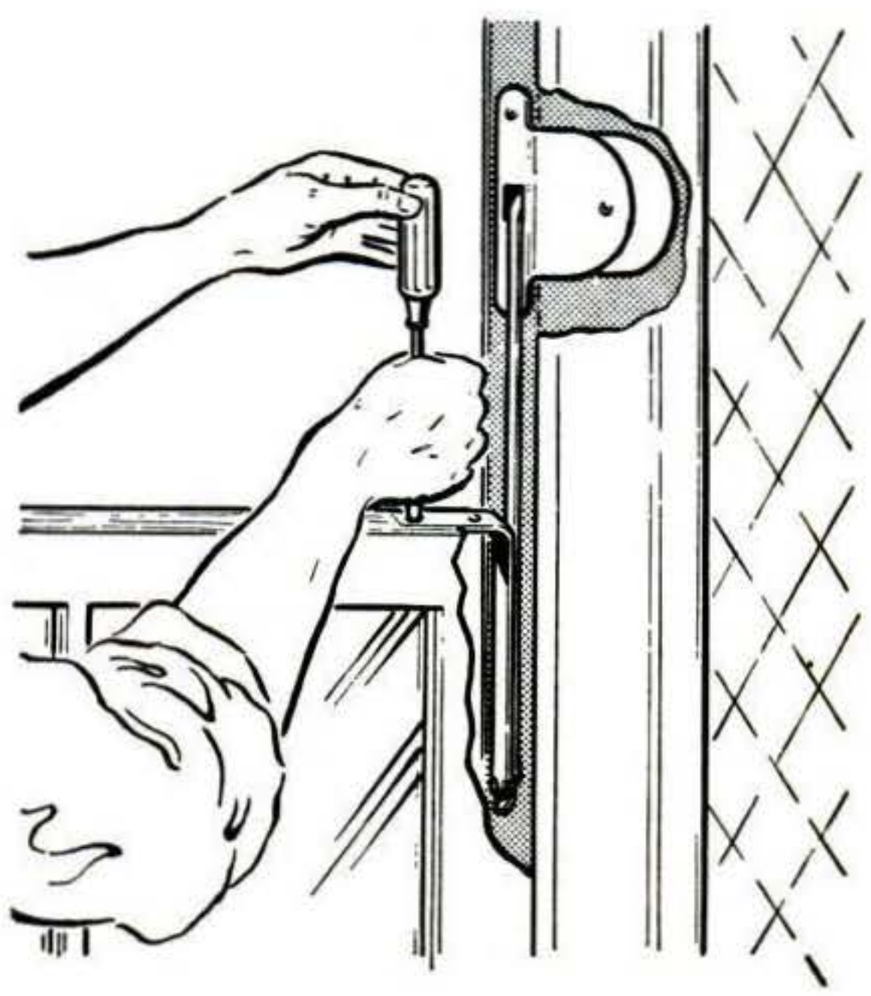
You can tell how fast a car is coming up behind you with the novel ***distance-measuring mirror*** at right. It has a tinted portion at top and bottom with a clear band across the middle. As a car approaches, the image moves down the mirror. At the top, it is about 100 yards away; at the middle, 20 yards; and at bottom, five yards or less. By watching how fast the image moves, you can judge the car's speed. At night, the tinted areas cut the glare of the headlights until they hit the clear middle portion where the sudden brightness warns you that the car is getting close. The mirror is made in Germany by Anton Eisenschink.

A low-cost spark analyzer (at right) is said to give you a quick check on coils, spark plugs and magnetos. A rotating, off-center ring on the front provides an adjustable spark gap so you can see the exact size of the spark without removing the plugs. By connecting it to the distributor and comparing different readings, you can spot improper gapping, spark-plug fouling, weak cylinder compression, faulty valves, bad breaker points and other troubles. The Fox Valley Instrument Co. sells the tester for about $10.

for the home handyman

A new type of spring balance for double-hung windows (at right) can be installed in a few minutes without even removing the sash. The spring spool is designed to fit into the same slot as the old sash pulley, eliminating the job of mortising a new opening. Then you simply hook the lifting tape to an L-shaped bracket and screw the bracket to the top of the sash. Pullman makes the balances in lengths to fit all window sizes for $1.50 apiece.



Do-it-yourself plumbing will soon appear in hardware stores in the form of flexible tubing and all necessary fittings for installing or repairing your own sinks, tubs and other fixtures. Made by the Plumb Shop, the tubing is chrome-plated, can be bent by hand and comes with compression-type connectors already attached that eliminate cutting and threading.

More new products on the next page

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Modern lamp poles (at left) come in interchangeable parts like an Erector set, enabling you to make almost any lighting or furniture arrangement you want. You can combine any of several lamp styles with round or square tables, bookshelves, cabinets, planters and desks—all designed to hang from one or two poles. The 1¼″ brass poles can be adjusted from 7′4″ to 9′3″ high and are held between floor and ceiling by a spring, requiring no fastening. Termax Sales sells plain poles for $8.95, lights for about $20 to $25 and tables for $10 and up.

A new wood panel, sort of halfway between plywood and chipboard, has no rough edges, holds screws well and is said to have better working characteristics than plywood. It's made up of thin shavings interlocked and bonded together into a uniform panel that's smooth, knotless and easy to paint. The Roddis Timblend comes in standard plywood sizes and thicknesses for doors, cabinets, counter tops and paneling . . . ***Foam plastic*** in rolls of self-adhering tape can be used as weatherstripping, sound-deadening pads or to prevent damage from sharp objects. It's made by United Mineral.

for more information:

Here's where to write if you can't get any item listed above: **Andersen Foods Division,** *Heublein, Inc., Hartford, Conn.;* **Argus Cameras Division,** *Sylvania Electric Products, 1740 Broadway, NYC.;* **Beham Co.,** *P.O. Box 683, Jefferson City, Mo.;* **Crescent Tool Co.,** *Jamestown, N.Y.;* **Crosman Arms Co.,** *Fairport, N.Y.;* **Eastman Kodak,** *Rochester, N.Y.;* **Anton Eisenschink,** *59 Kaulbachstr., Munich 22, Germany;* **Fox Valley Instrument Co.,** *Highway 27, Sheboygan, Mich.;* **C. M. Hall Lamp Co.,** *Detroit;* **Hamer-Dril Co.,** *514 Greenwich St., NYC 13;* **Henlon Corp.,** *Vestal, N.Y.;* **Kool-Fin Industries,** *Garnett, Kan.;* **L/T Sales,** *5818 Sherbourne Dr.,*

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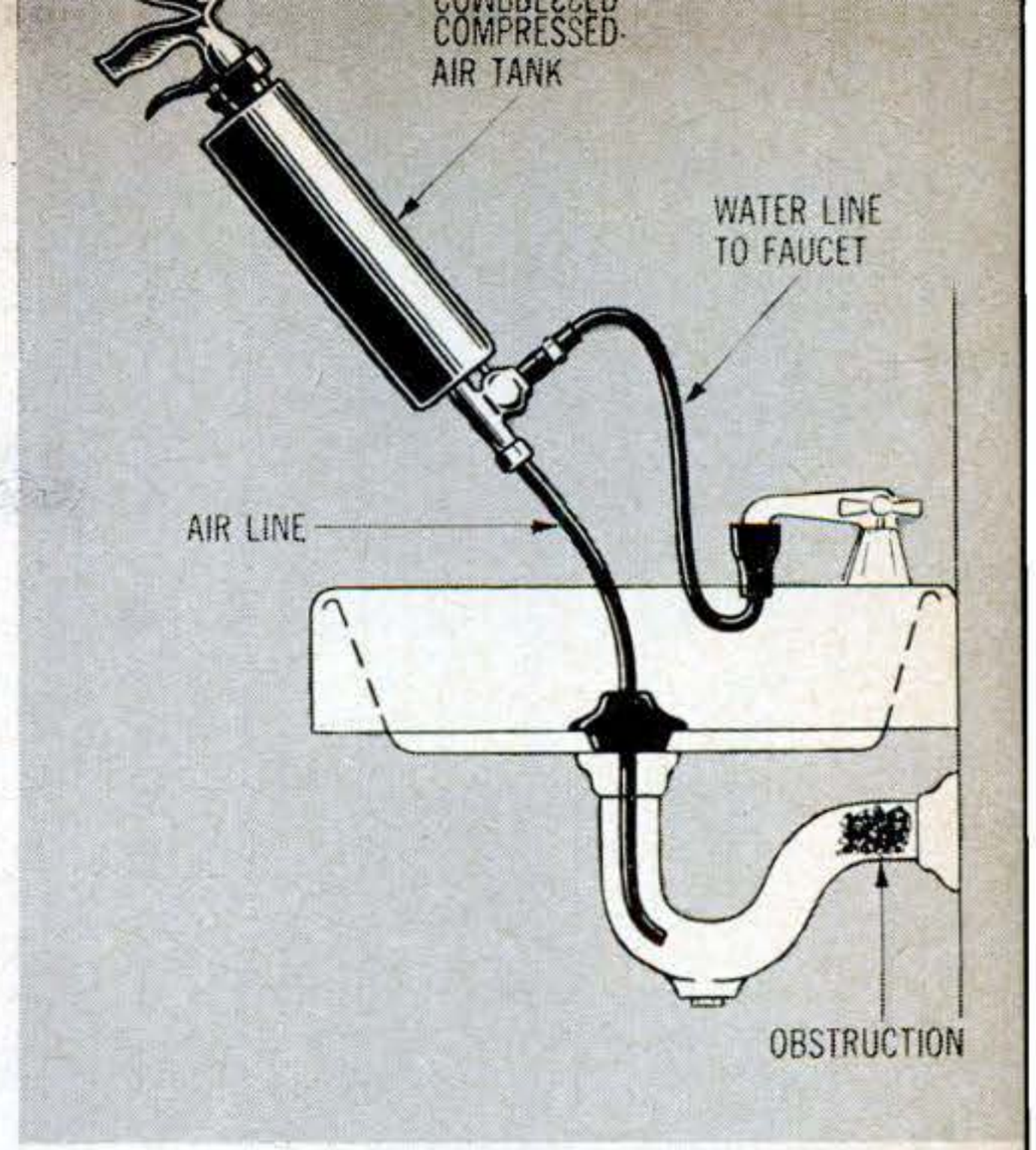
A high-powered version of the old "plumber's helper," recently tested by POPULAR SCIENCE, "shoots" a blast of air to clear clogged drain pipes. You first pump up a small air tank and insert one hose into the drain, as at right. A second hose from the faucet fills the drain with a solid column of water between the air gun and the obstruction. When you trigger the gun, the air impact is transmitted through the water to the obstruction, no matter how far away it is or how many bends there are in the pipe. The Miller Sewer Rod Co. sells the gun for $59.95 . . . ***Two new painting aids:*** Hook-on metal brackets, made by R. A. Ness, quickly convert a stepladder to an easel for holding screens and storm windows . . . ***A sash brush with a built-in shield,*** sold by Watro, keeps paint off window glass.



a variety of new things

First magazine-loading air rifle made in the U. S. (at right) has been introduced by Crosman. Two interchangeable clips each hold 10 .22-cal. pellets, which can be fired as fast as you can cock and slide the bolt. Operated by compressed-CO_2 cartridges, the new rifle sells for about $25 . . . ***A cord reel for electric razors*** automatically winds up the slack when you've finished, keeping the cord neat and untangled. The reel plugs directly into any wall outlet. It's sold by L/T Sales (about $2) . . . ***Pushbutton barbecue sauce*** is now made in spray cans by Andersen Foods for easy application to back-yard steaks.

Two new 35-mm. cameras are aimed at easier, more versatile snapshooting. Eastman Kodak's reflex Retina (near right) offers ground-glass focusing through a prism, interchangeable lenses and a dual exposure system using both *f* stops and the simpler EVS numbers. It sells for $215 with standard 50-mm. f/2 lens. A new Argus C3 (far right) eliminates *f* stops completely. You simply set it for "scenes" or "action" and an attached light meter automatically shows the correct lens opening to use. It sells for $74.95.

Sheldon Gallager

Los Angeles; **Miller Sewer Rod Co.,** *4642 N. Central Ave., Chicago 30;* **P & C Tool Co.,** *P.O. Box 5926, Portland 22, Ore.;* **George Playter,** *P. O. Box 1, Hawthorne, N.J.* **Plumb Shop,** *1341 Temple, Detroit 1;* **Proto Tools,** *2209 Santa Fe Ave., Los Angeles 54;* **Pullman Mfg. Corp.,** *325 Hollenbeck St., Rochester, N.Y.;* **Radiator Specialty Co.,** *Charlotte, N.C.;* **R. A. Ness,** *5083 Elston Ave., Chicago 30;* **Roddis Plywood Corp.,** *Marshfield, Wis.;* **Stanley Tools,** *111 Elm St., New Britain, Conn.;* **Sunbeam Corp.,** *5600 Roosevelt Road, Chicago 50;* **Termax Sales Co.,** *82 Stephen St., Levittown, L.I., N.Y.;* **United Mineral & Chemical Co.,** *16 Hudson St., NYC 13;* **Watro Mfg. Co.,** *156 Muir Ave., Hazleton, Pa.;* **J. H. Williams & Co.,** *400 Vulcan St., Buffalo 7, N.Y.;* **Wright Mfg. Co.,** *Phoenix, Ariz.*

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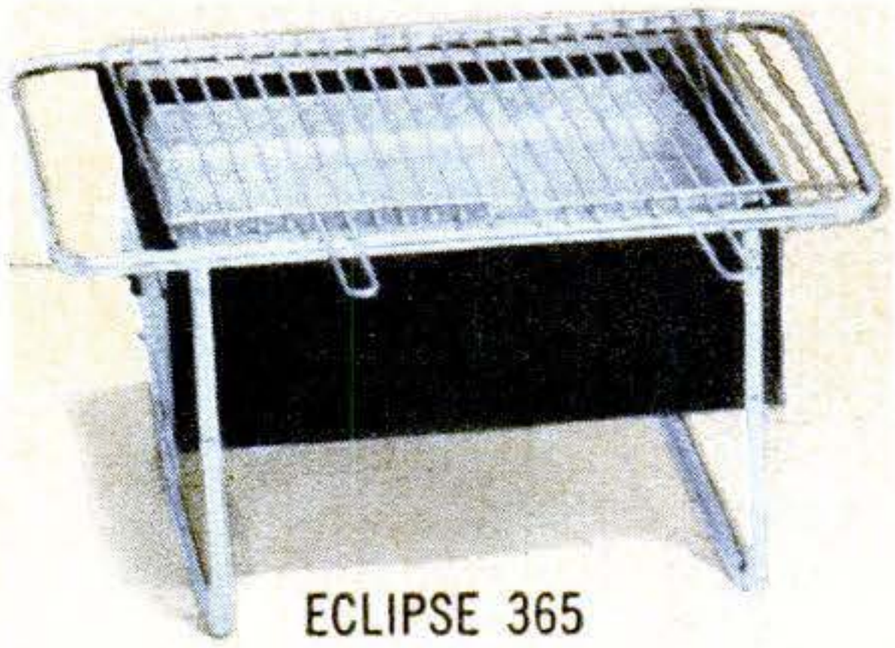

ECLIPSE 365

CHAR-BROIL

PRIZER-PAINTER 25

STANDARD CAN

KING

B. ALTMAN HIBACHI

BIG BOY DL12-F

ECLIPSE 26

The year's big news in back-yard cooking:

Barbecues for the Table Top

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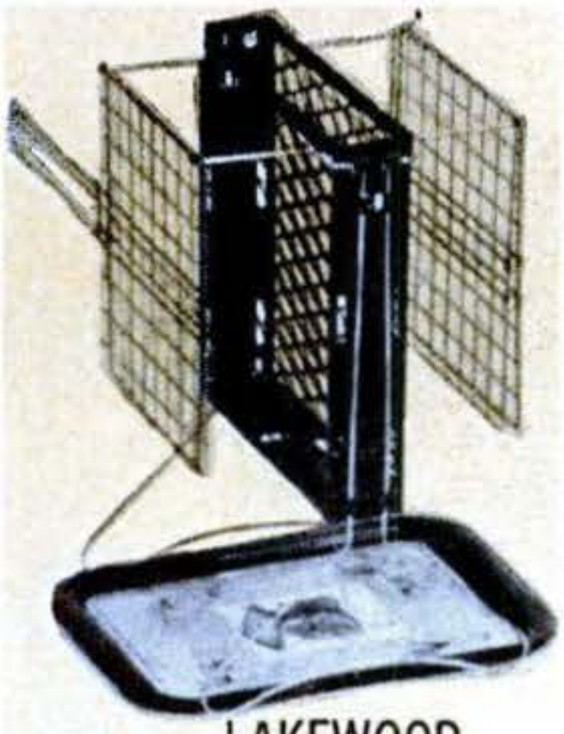


LAKEWOOD

WASHBURN 145

WEBER SJ-100

CHATTANOOGA RCY-2

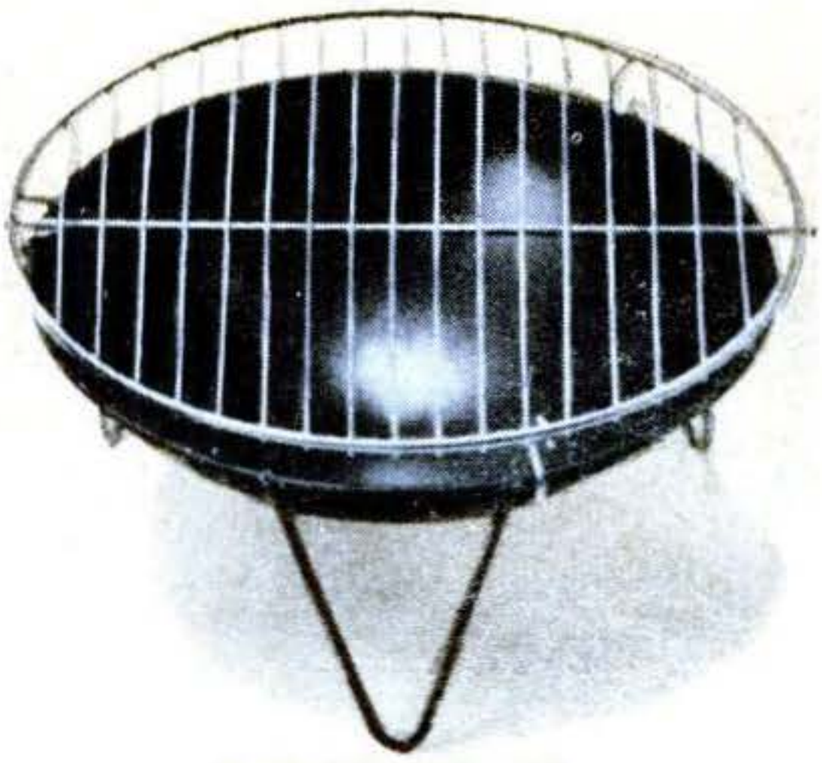
HAMILTON-SKOTCH 888

COOK 'N' TOOLS 565

BURR-SOUTHERN CC50

MIYA HIBACHI

HAMILTON-SKOTCH 555



BAR-B-BOWL 70

YOU'LL see this brand-new crop of baby charcoal grills popping out in stores all over the country this year. You can set them up on a patio table, tote them to the beach or pack them along on auto trips. You can even use them indoors in a fireplace or under a kitchen exhaust fan. Prices range from $1.98 for Standard Can's 2¼-lb. midget up to $24.50 for the rugged cast-iron King. Nine are under $10.

who sells them:

Here's where to write for more information on the barbecues above: **B. Altman & Co.**, *5th Ave., NYC;* **Bar-B-Bowl**, *175 5th Ave., NYC 10;* **Big Boy Mfg. Co.**, *59 E. Orange Grove Ave., Burbank, Cal.;* **Burr-Southern Corp.**, *241 N. Allen Ave., Pasadena, Cal.;* **Char-Broil**, *Abercrombie & Fitch, Madison at 45th St., NYC;* **Chattanooga Royal Co.**, *Chattanooga 6, Tenn.;* **Cook 'N' Tools**, *Box 949, Tulsa, Okla.;* **Eclipse Metal**, *Eden, N.Y.;* **Hamilton-Skotch Corp.**, *11 E. 36th St., NYC 16;* **King**, *Abercrombie & Fitch, NYC;* **Lakewood Mfg. Co.**, *25100 Detroit Road, Westlake, Ohio;* **Miya Co.**, *39 E. 28th St., NYC 16;* **Prizer-Painter Stove Works**, *Reading, Pa.;* **Sears, Roebuck**, *Chicago 7;* **Standard Can Corp.**, *Box 68, Leetsdale, Pa.;* **Washburn Co.**, *28 Union St., Worcester 8, Mass.;* **Weber Bros. Metal Works**, *108 N. Jefferson St., Chicago 6.*

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Here's how to prefab a:

Vacation Shelter for Less Than $500

By Darrell Huff

It's just one big room with a patio out in front,

THE bottom-cost vacation shelter I put up last season is remarkable in seven ways, all of them appealing. Count 'em:

- You and a helper can erect it in a weekend after putting in perhaps a day precutting it at home.
- You can tote all the parts to your woodland, lakeside or seashore site in one trip with a rental trailer.
- You can batten it down in minutes, when the holiday's over, and forget it: There are no windows to break or conspicuous door locks to jimmy.
- You can increase its basic size of 12 by 16 feet by two-thirds when—at your leisure—you add a patio wall and flip up the whole front of the cabin.
- You can, with a little work, demount it for trailer-hauling to a new site if you get a hankering for a change of scene.
- You can arrange, or rearrange, sleeping, cooking and living equipment in any way you like since it's a basic rectangle with no bearing partitions.
- And you'll spend less than $500.

The secret of this mostest-for-leastest structure is its use of modern big-sheet materials—two of them flat, two corrugated.

The stout floor goes down in minutes because it consists of just six pieces—full 4′-by-8′ panels of the 1⅛″ fir plywood made by many mills under the general label 2.4.1.

The second flat-sheet material is plywood too, the pregrooved 1-11-type wall panels that fit together without showing a trace of joint.

For color and light, the whole front

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but this modern holiday shack will give you a lot of lazy living—wherever you want to build it.

Precut and marked at home, the parts all fit on a rental trailer for the trip to the vacation site.

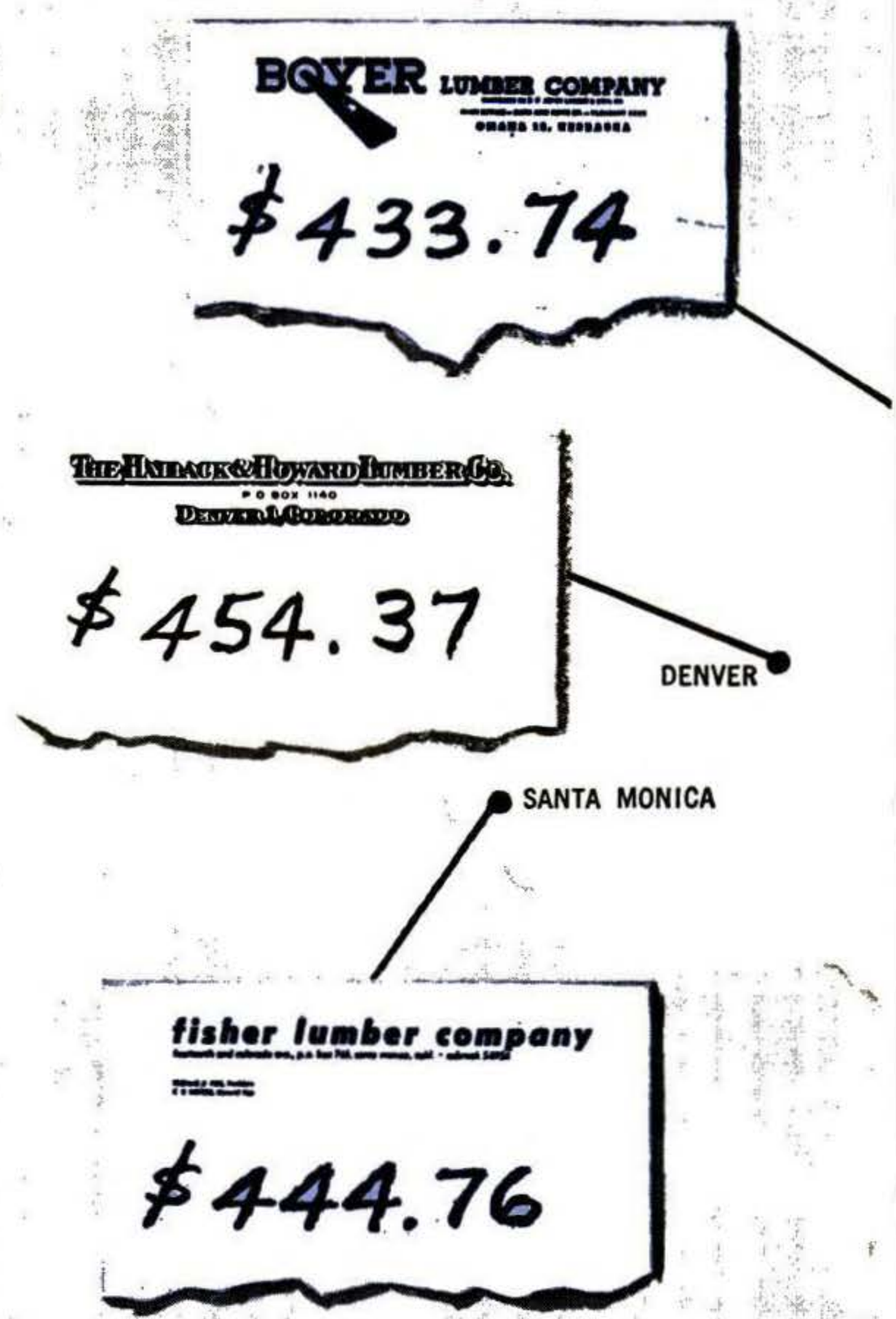
Cost? Less than $500 from any lumber dealer in the U.S.

Figures quoted for major population centers give a rough idea of what you would pay for materials in your area.

THE MATERIALS YOU NEED

3" by 4" or 4" by 4" cedar or redwood	8 pcs. 8′
	10 pcs. 14′
	2 pcs. 16′
2" by 8" fir, spruce or redwood	3 pcs. 12′
	2 pcs. 16′
2" by 6" "	2 pcs. 10′
2" by 4" "	4 pcs. 8′
	16 pcs. 10′
	4 pcs. 12′
	3 pcs. 16′
2" by 3" "	6 pcs. 18′
2" by 2" "	1 pc. 10′
	1 pc. 12′
	2 pcs. 14′
1" by 1" "	5 pcs. 18′
2-4-1 plywood, 1⅛"	6 panels 4′ by 8′
Texture 1-11, ⅝"	10 panels 4′ by 8′
Cor. alum. roofing with 2½" corrugations	10 sheets 48¼" by 8′
Cor. glass-fiber sheet with 2½" corrugations	5 sheets 40" by 8′
Concrete blocks	6

Hardware: 5 pr. 5" T-hinges (for swing-up doors); 5 pr. 3" by 3" butt hinges (for door supports); 4 sets hooks and eyes; 1 hasp and padlock; 3′ wire screen 4′ wide with tacks; 40 2"-10 flathead wood screws; two 20′ steel clotheslines; two 6" turnbuckles; four line clamps (for cabin braces); 1 lb. 1¾"-by-10-gauge aluminum nails (for plastic panels); 2 lb. 1¾"-by-11-gauge galvanized nails; 4 lb. 10d common nails.



wall is a cheerful lemon-yellow version of corrugated sheet plastic.

Corrugated aluminum for the roof is the embossed kind in 48½"-by-8′ sheets that nest perfectly with the plastic and take up almost no space on the trailer.

The shelter has its limitations, as you can easily see. It *is* just a shelter—as a tent is a shelter—and you'll have to make your own bathroom and kitchen arrangements.

Where I built it (in California) it's okay to rest the structure on a few con-

FRONT WALL SECTIONS SWING UP on hinges to form the roof of a patio in front of the shelter. The wall sections are made of corrugated plastic sheets on a 2"-by-3" wood frame.

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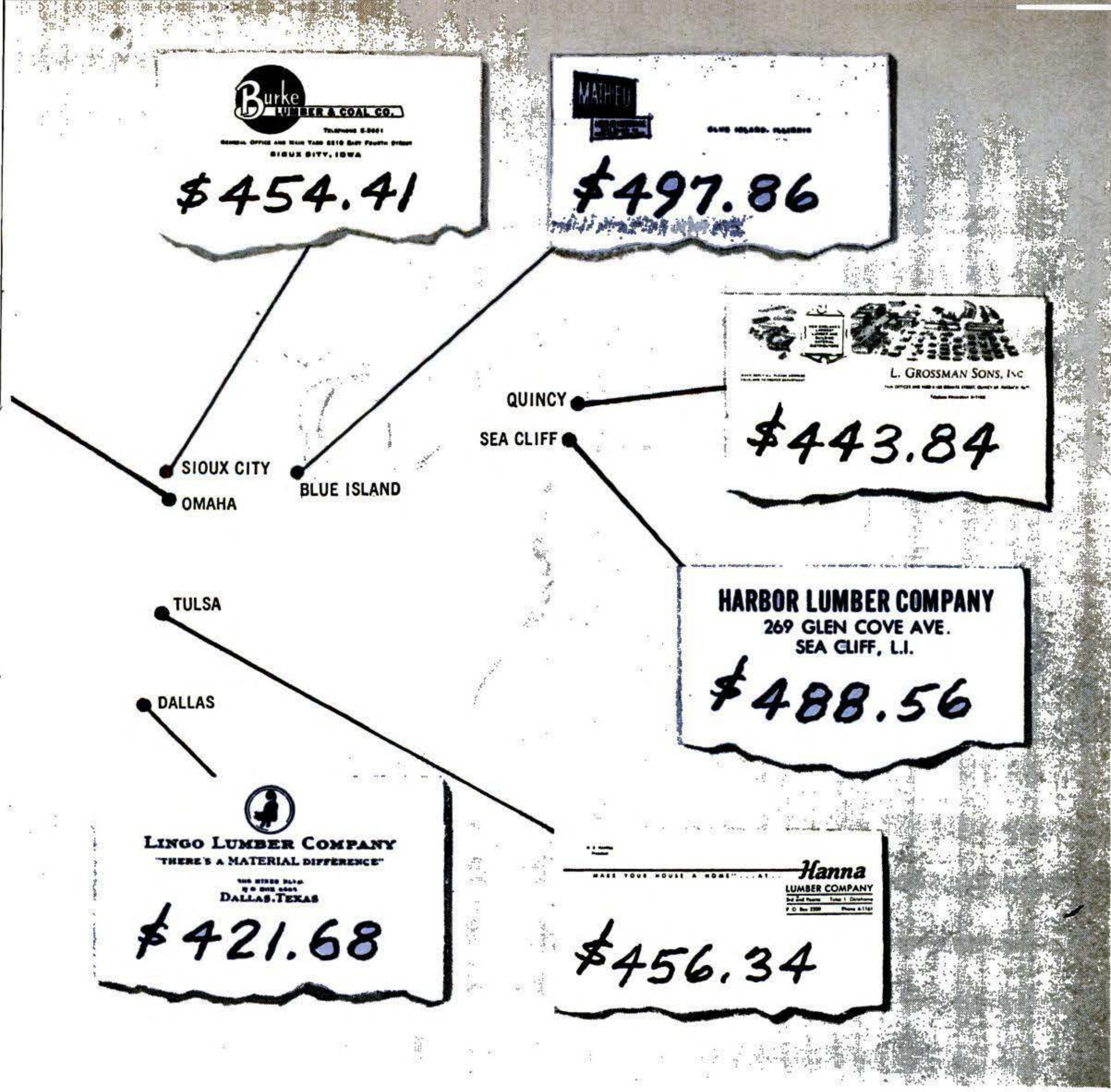

crete blocks. But in most of the country you'd have to provide a foundation below the frost line for a year-round structure. And in areas of heavy snows the roof needs more pitch.

But these are matters for individual decision. The big point is that here's a low-cost shelter you can own a week from the time you read about it.

Begin at the bottom—with the foundation. Assemble the front, rear, side and center joists into a rectangular frame and add the front and rear girders. Use footings at six places—three across the front girders and three across the rear, to support the frame and raise it off the ground. Level the frame and add shims to the supports, if necessary, to fit the slope of the ground. Spike two-by-four ledger strips to both sides of the center joist and to the inside of each side joist to support the two-by-four strips that form the grid for the flooring. Nail down all edges of the six 4′-by-8′ floor panels.

Erect the posts, starting with those at the corners. Toenail them through the floor and into the joists. The tops of the posts that were cut to 95 degrees with the miter box should slant uniformly to the rear, and the side rafters should bear on the front plate and all side posts.

Fasten rafters to posts with plywood splices. Use splices on *both* sides of joints where rafters meet back posts; single splices inside joints at sides of cabin.

Nail walls to posts. Walls, made of big

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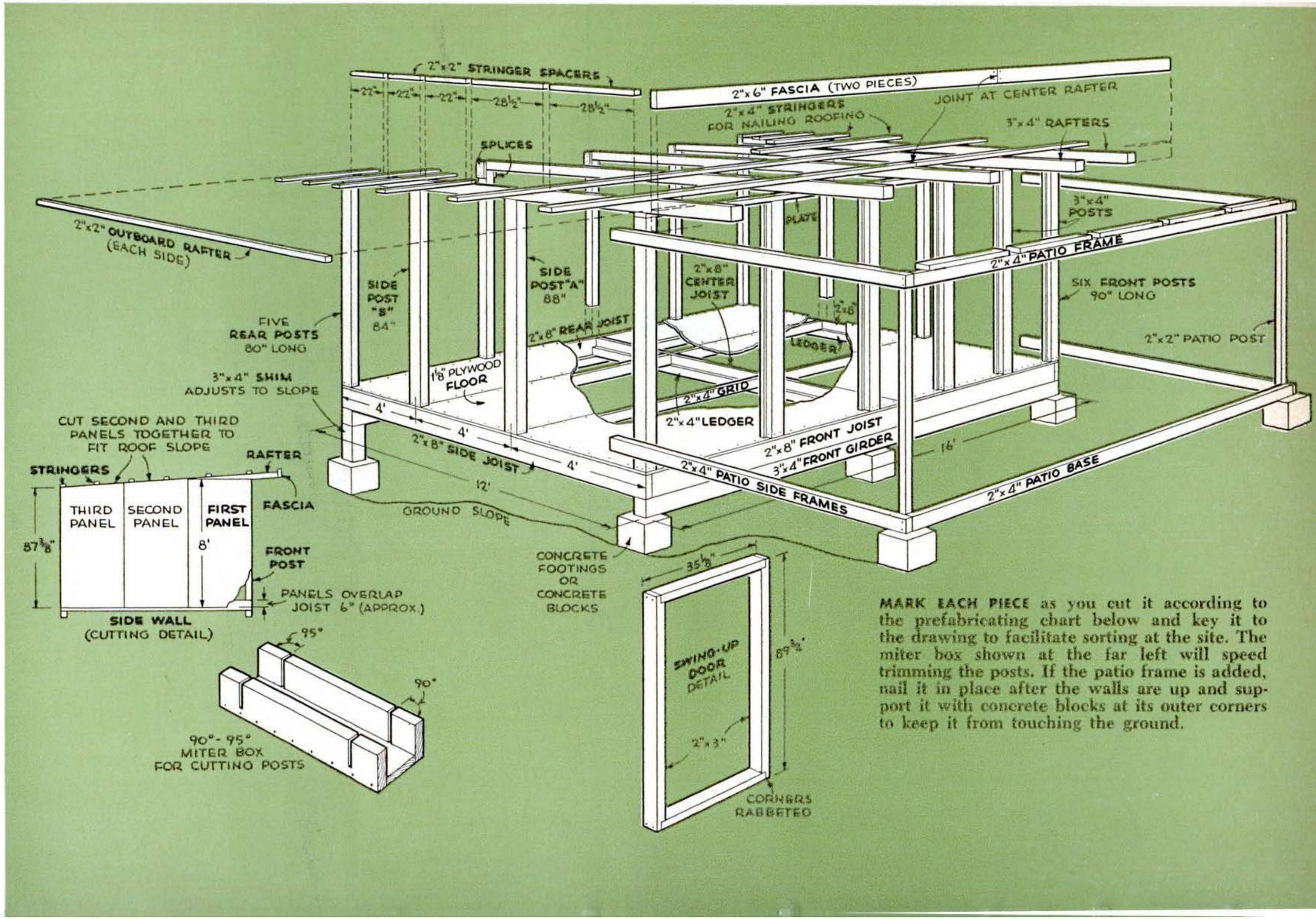

MARK EACH PIECE as you cut it according to the prefabricating chart below and key it to the drawing to facilitate sorting at the site. The miter box shown at the far left will speed trimming the posts. If the patio frame is added, nail it in place after the walls are up and support it with concrete blocks at its outer corners to keep it from touching the ground.

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4′-by-8′ pieces (see cutting detail), go up fast.

Nail roof stringers across rafters, separating them with the precut spacers nailed on the side rafters. Stringer halves (precut to 9′ 3½″) are butted on the center rafter to make full 18′ 7″ stringers that overlap the walls 1′ 3½″ on each side. Nail outboard rafters to stringer ends and nail the fascia strips in position.

Nail the corrugated aluminum roofing to the stringers, beginning with a 6″ overhang at the rear. Drive nails in the high part of the corrugation to prevent seepage of water through nail holes. Use composition closure strips along the rear wall and over the front doorways for a tight seal. The last row of roofing sheets on the front overhang the fascia about 4½″.

Hang the door frames on T hinges, then cover them with overlapping sheets of corrugated glass-fiber. Work from the left side, covering the door on the right side *last* so it can be used as an entrance door without disturbing the other sections. Fit a hasp and padlock on the right door and a hook and eye on the inside of each of the others. Hinge 3′ lengths of two-by-six along the top of the patio frame opposite the doors. Flipped outward, they allow the doors to be swung up past the frame. Then flipped toward the cabin, they provide a support for the doors, which become a translucent roof for the patio.

Finish up by nailing the twelve 3⅝″ pieces of two-by-four to the sides of the rafters in the space between the front plate and roof stringer. Tack or staple strips of wire screen between each rafter to keep out insects.

Brace the cabin against twisting by stretching steel clothesline on turnbuckles from diagonal corners. If you hanker for privacy, just nail panels of flat or corrugated glass-fiber at strategic locations in the patio frame. END

Prefabricating Chart

MATERIALS ORDERED		HOW TO CUT	HOW TO MARK
3″ x 4″ or 4″ x 4″	8 pcs. 8′ long	Cut 6 pcs. 90″ long Cut 2 pcs. 88″ (miter 1 end 95°)	Front posts Side posts "A"
	10 pcs. 14′	5 pcs. full-length (1 end mitered 95°) 5 pcs. 80″ long (1 end mitered 95°) 2 pcs. 84″ long (1 end mitered 95°) Cut waste as needed	Rafters Rear posts Side posts "B" Pier shims
	2 pcs. 16′	Use full-length	Front & rear girders
2″ x 8″	3 pcs. 12′	2 pcs. full-length Cut 1 pc. to 11′ 8¾″	Floor side joists Center joist
	2 pcs. 16′	Cut to 15′ 8¾″	Front & rear joists
2″ x 6″	2 pcs. 10′ 1 pc. 16′	Cut to 9′ 5⅛″ and butt Cut to 5 pcs. 36″	Fascia Flip rests for doors
2″ x 4″	4 pcs. 8′	Cut to 7′ 9-9/16″	Floor grid
	16 pcs. 10′	Use 4 pcs. full-length Cut 12 pcs. to 9′ 3½″ Cut waste into 12 pcs. 3⅝″ (one end mitered 95°)	Patio side frames Roof stringers Screen blocks
	4 pcs. 12′	Cut to 11′ 8¾″	Floor ledger strips
	3 pcs. 16′	Use full-length	Plate & patio frames

MATERIALS ORDERED		HOW TO CUT	HOW TO MARK
2″ x 3″	6 pcs. 18′	Cut and assemble with glue and screws as shown in door detail	Swing-up doors
2″ x 2″	1 pc. 10′	Cut 4 pcs. 28½″	Roof-stringer spacers
	1 pc. 12′	Cut 6 pcs. 22″	Roof-stringer spacers
	2 pcs. 14′	Use full-length	Outboard rafters
1″ x 1″	5 pcs. 18′	Cut into 10 pcs. 90″ & 5 pcs. 34″	Door stops
2-4-1 ply	6 panels 4′ x 8′	Use panels full size	Floor
Texture 1-11 ⅝″ DFP	10 panels 4′ x 8′	Cut 4 panels to 89″ Use 2 panels full size Cut 4 panels as shown in side-wall cutting detail Cut waste into 8 pcs. 3½″ by 7″	Rear wall First panel—side walls Side walls Rafter-to-post splices
Cor. alum.	10 sheets 48¼″ x 8′	Use full size	Roof
Cor. glass fiber	5 sheets 40″ x 8′	Use full size	Swing-up doors

Want a Home and Shop Index?

An index of the home, shop and handicrafts articles that appeared in Popular Science from July, 1957, through June, 1958, is now available, free. To get your copy, write to: Index Editor, Popular Science, 353 Fourth Ave., New York 10, N.Y.

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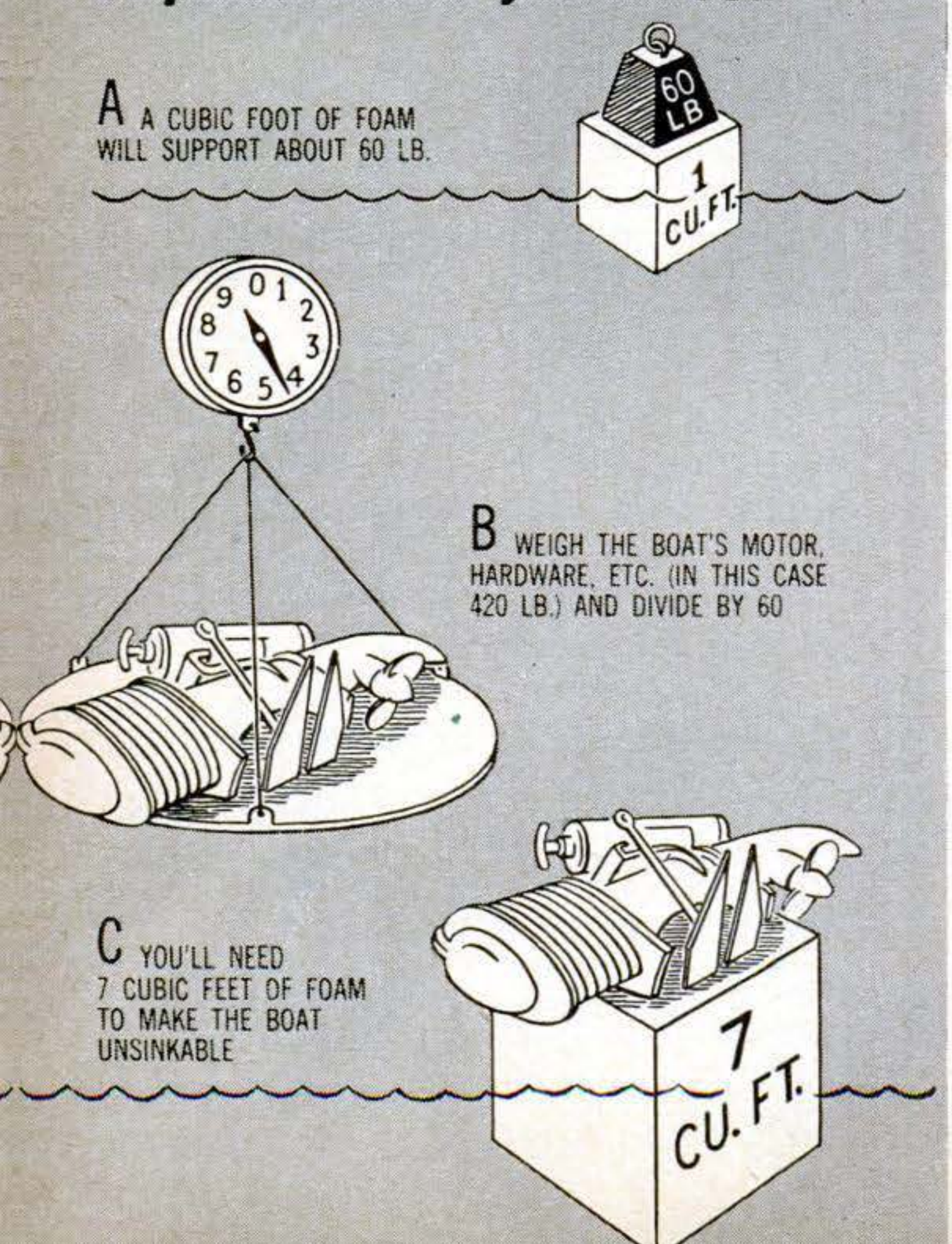
TUCKED AWAY INSIDE, this 10-cubic-foot load of plastic-foam planks will support the weight of two outboards and all the extras, should this 17-footer capsize. Cost: about $40.

How to figure the amount of plastic foam you'll need



How to Make

WHEN a boat capsizes or fills with water because of hull damage, the dead weight of the motor, controls, fittings and accessories causes it to lose its natural buoyancy. It sinks. Boost the buoyancy enough and the flooded boat will remain afloat.

Many commercial models today have this built-in safety factor. You can add it yourself to your own boat, using an easily worked expanded-plastic foam as a packing. You've seen it—Styrofoam—carved into figures and decorations for Christmas store-window displays. That is the pure-white stuff. For boats, however, the maker (Dow Chemical Co., Midland, Mich.) recommends Type 33, a blue-tinted variety that is fire resistant. Most marine-supply dealers have it.

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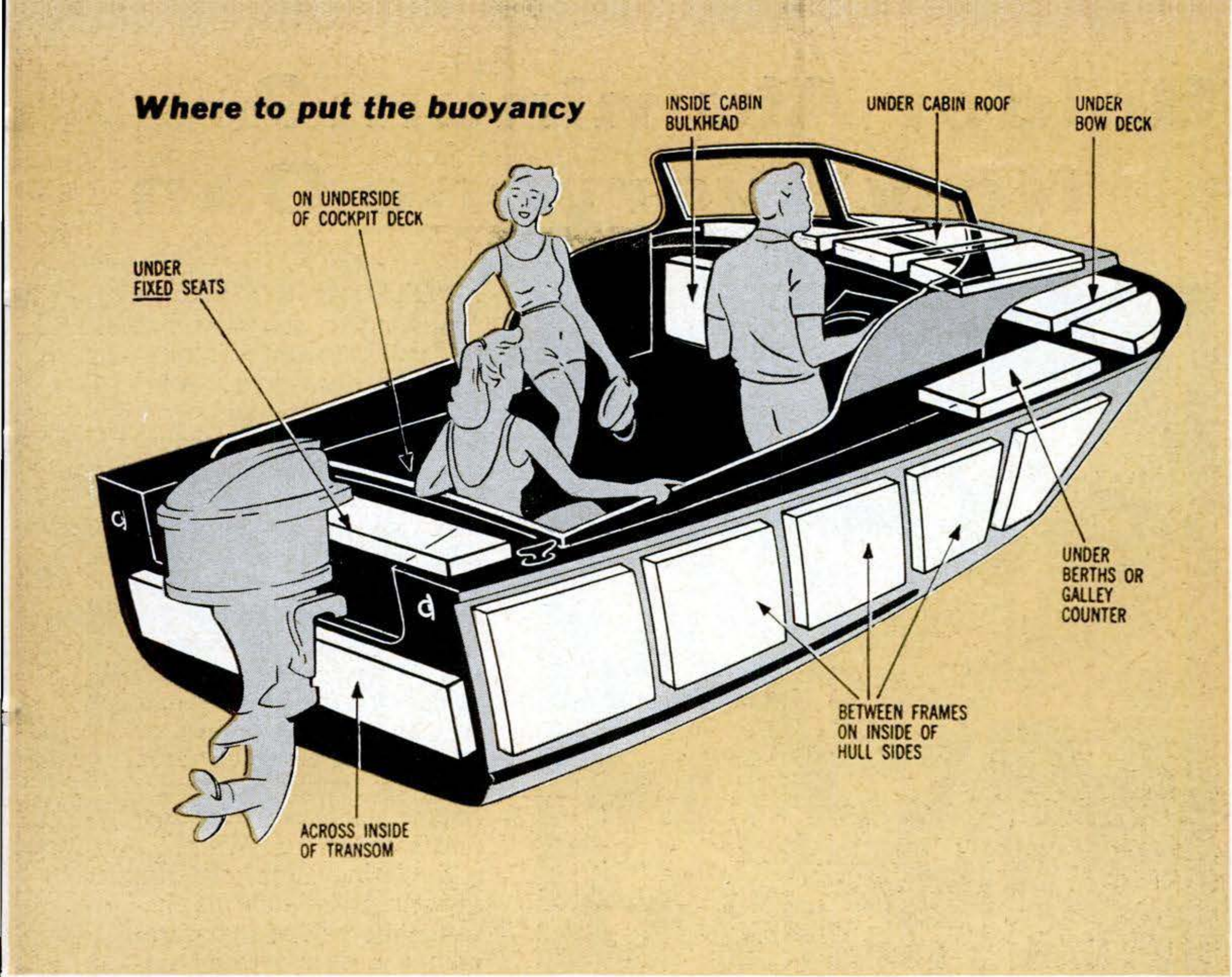

EVEN A SMALL CRUISER has plenty of spare space to stuff in enough chunks of expanded plastic foam to keep you afloat under all conditions. When fitting the boat out, do *not* cover the buoyancy slabs directly with marine paints. They will dissolve the plastic. First protect the foam by using several barrier coats of shellac or water-base house paint underneath.

a Boat Unsinkable

How much will you need? Each cubic foot of the plastic foam will float about 60 pounds of dead weight. Since a stripped wood hull will stay afloat even when filled with water, you can forget it. Start figuring the weight of the motor, hardware and all sinkable gear you have aboard. Add it up and divide by 60. The answer is the number of cubic feet of foam you'll have to tuck inside your boat to make it nonsinkable. Lean to the generous side, and allow 20 percent for waste. If there are items you can't actually weigh on a scale, marine catalogues or the manufacturer's specifications will give you the weights.

Where to install it. Any out-of-the-way space *above* the water line can be used for packing in the plastic foam. Best locations are along the hull sides, transom space, bow compartments, the underside of decks or fixed seats. *Don't* install any foam in the bilges, even though the open space may be tempting. Gas and oil will dissolve it, and buoyancy placed too low will tend to tip the boat if it should flood. Besides, bilges should be kept clear for draining and easy cleaning.

How to install it. Since an *upward* strain of 60 pounds will be exerted on each cubic foot of foam if it is submerged, the chunks must be held firmly in place. Cementing is not recommended. The foam, which is easy to cut with a saw or knife, can be snug-fitted into odd-shaped spaces. Then it should be boxed in by sheathing or held in with retaining battens. —*Martin Toggweiler, Seal Beach, Cal.*

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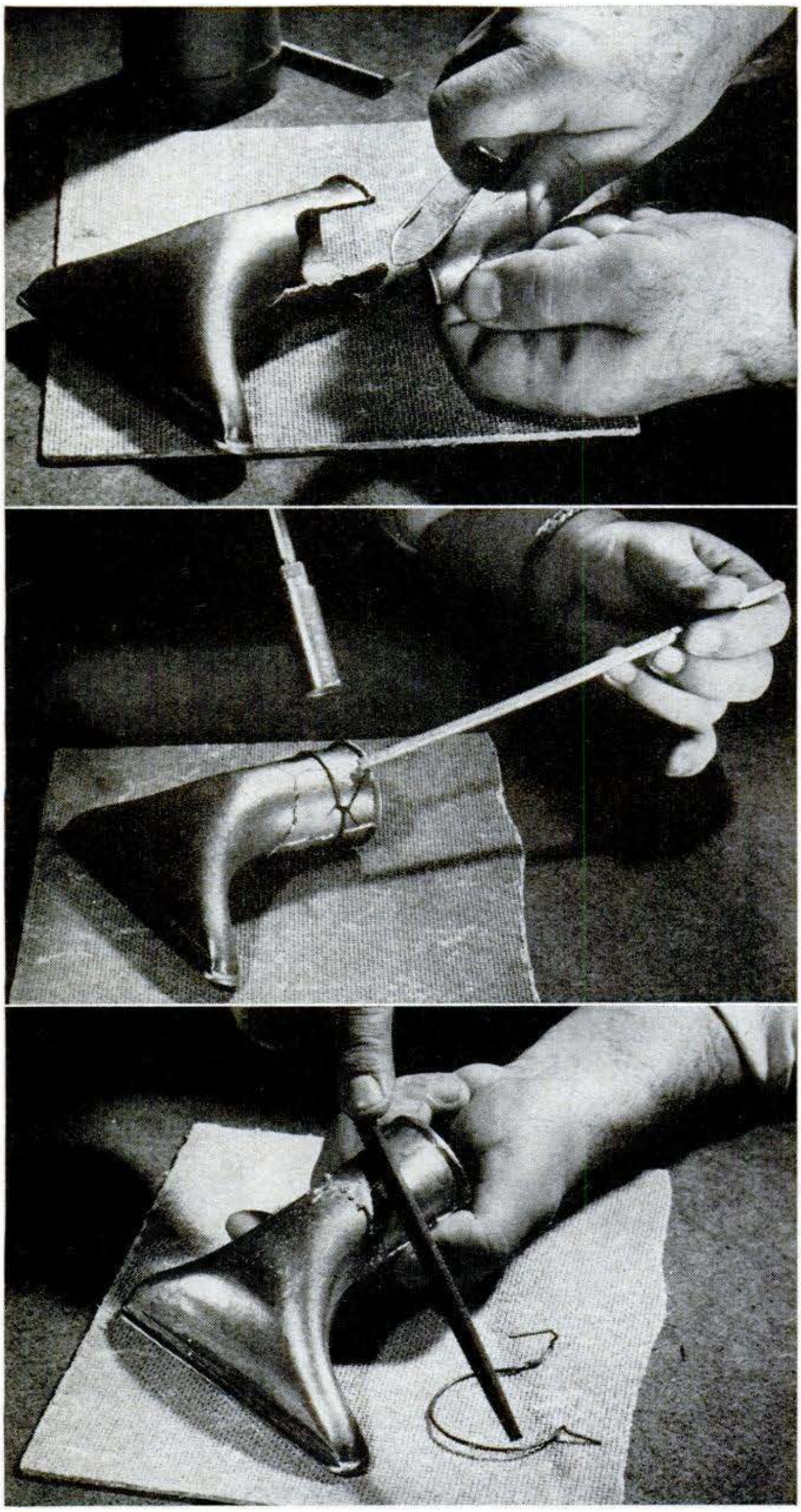
Solder Aluminum? Now Everyone Can



TYPICAL REPAIR, on a cast vacuum-cleaner nozzle, is shown above. Broken edges are beveled with a knife (top photo) so they come together to form a V groove. The pieces are tied with a wire (center) or clamped and the entire part is heated until the alloy flows into the V groove on contact. After the wire has been stripped off, the solder is filed flush with the casting. This makes a joint that is practically invisible.

SOLDERING aluminum, a job that has hitherto defied almost everyone, has now moved into the home—and even the kitchen—with a product newly available in stores.

Patented last year, the new solder—an alloy of zinc, lead and tin—is sold as a bar about nine inches long attached to an instruction card that tells where it can be used and how. The price: 49 cents for a one-bar card in hardware stores, or 98 cents for a two-bar card sold by such mail-order houses as Sears, Roebuck and Montgomery Ward.

Soldering aluminum has always been difficult because the oxides that form on its surface prevent adhesion of the alloy. The new solder flows beneath the oxides to produce a strong bond. No flux is required and you don't have to clean or scratch the surface. The alloy melts readily and puddles when the metal being joined is heated to 500 degrees. Gentle heat, permitted to build up slowly to soldering temperature, is best. You can use the flame of a kitchen gas burner or even an electric hot plate to heat the work, but a propane torch is recommended because it provides better control of the heat and permits working on all sides. A soldering gun or iron is not suitable except on very small jobs.

The new solder was developed and patented by Samuel Freedman of San Diego, Cal., and is packaged

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A HOLE IN A SAUCEPAN or a coffee pot is a simple fix. Just place the empty pot on the gas stove and heat it with a medium flame. Rub solder over the hole until it puddles, then turn off the flame. Aluminum tubing, rod and angle can be joined as easily with the solder.

for consumers by Chemalloy Electronics Corp., Santee, Cal.

What the solder can do. Besides joining aluminum and repairing kitchen utensils, the new alloy does a job formerly considered all but impossible: repairing cracked or broken aluminum or pot-metal castings. Such items as outboard and lawn-mower engine housings, many auto parts, vacuum cleaners and their accessories once were discarded when they broke, or at best they were patched with mending plates and small bolts. Now, by flowing a fillet of solder into a V groove gouged along the crack, you can restore the casting to like-new condition. By filing the fillet flush with the casting, you can make the repair invisible.

The solder also adheres to brass, copper and galvanized steel, making it possible to join aluminum to these metals. Copper wires or lugs can be soldered to an aluminum chassis to make firm electrical connections. Because no flux is used, connections remain free from corrosion, and vibration won't loosen them. END

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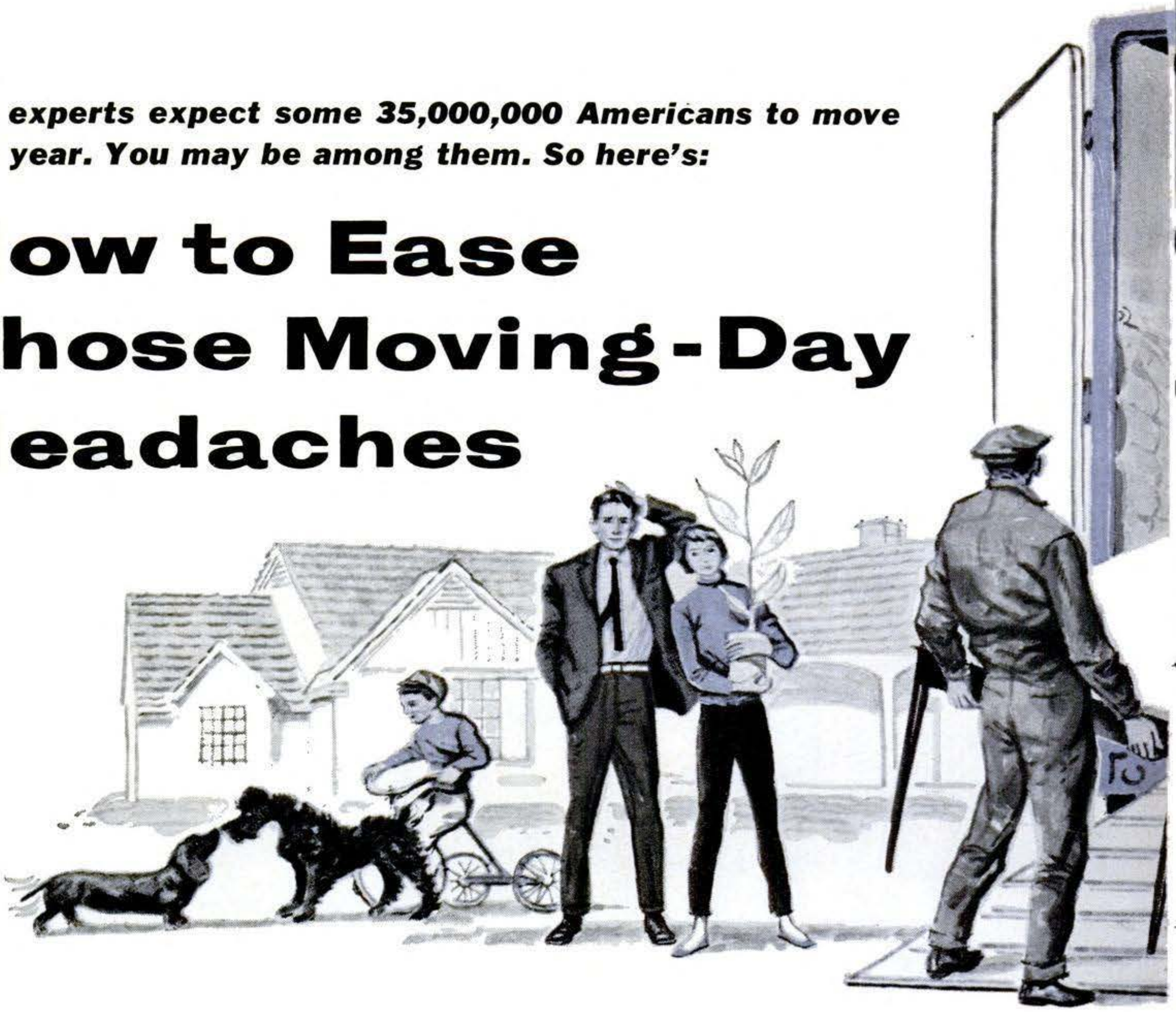
The experts expect some 35,000,000 Americans to move this year. You may be among them. So here's:

How to Ease Those Moving-Day Headaches



By George H. Waltz Jr.

YOU aren't planning to move? Well, the chances are better than one in five that you'll be living in another home before a year is up. What's more, the odds are one in 30 that you'll have shifted your home across a state line, moving almost two tons of household belongings about 600 miles for a round-figure cost of better than $300.

That's what the statistics see in your future. One thing for sure, however—if you haven't moved in years you'll find that moving isn't a muscle job any more. Today, moving is a highly developed technique and moving men are specialists, schooled in the knack of wiggling hi-fi consoles safely through narrow doorways and snaking long modern sofas around cramped stairway corners. They know how to cope with such aids to modern living as freezers, TV sets, washers, dryers, air conditioners, refrigerators, power mowers and even motorized home workshops.

You can do as much or as little of the actual moving work as you want. If you have the cash, you can turn the entire job over to a moving company and go off on vacation. The movers will pack your gear—not overlooking that old pair of shoes stuffed back in the corner of your closet—move it, and set you up in housekeeping at your new address.

If you don't want to stretch the budget that far—and few do—you can have the moving company help with the packing, move you, place your furniture where you want it in your new home, and then help you unpack. Or, if you want to trim the moving expenses to a minimum, you can do all of the packing and unpacking yourself and just depend on the movers for the actual move.

Now, suppose you actually have a move in the offing. What should you do?

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Specialists of the nationwide Aero Mayflower Transit Company, Inc., suggest this program:

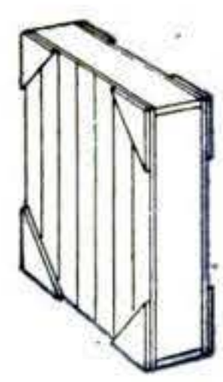
1. *Set the moving date* as far in advance as you can. Try to move in the middle, not at the end, of a month.

2. *Survey your belongings.* Throw away the things you won't need.

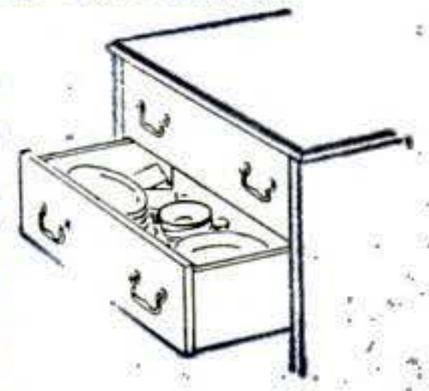
3. *Get an estimate* from a reputable mover, but remember that the figure you get is just that. The actual cost of your move will be determined by the man-hours required, plus mileage if it is a local move, or actual weight and mileage if it is an interstate move. Add to this the cost of any special services.

Local and inside-a-state moves can vary in cost according to the city. In Chicago, for instance, the present rate is $19 an hour for the use of a van plus the services of three men, plus a mileage charge of $4 a mile for the first five miles, $1.50 for each of the next 20 miles, and $1 for each

3 important moving-day don'ts



DON'T USE GREEN LUMBER in an attempt to save money if you are buying wood to make crates for large items. Why pay to move moisture? A crate made of green wood can weigh twice as much as one made from seasoned wood. Besides, good lumber always can be re-used in your new home.



DON'T FILL FURNITURE DRAWERS with linens and heavy odds and ends. The weight may damage the entire piece during the move. Use drawers for light stuff.

DON'T TRY TO BOSS THE MOVING MEN while they work. If they're from a reliable company, they know their jobs. However, they do like to have someone around to answer questions that may arise.

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THE RIGHT CONTAINERS are an important part of packing know-how. If cartons are used, sturdy ones, especially designed for the purpose, are best for protecting fragile dishes and glassware.

Each piece should be wrapped in newspaper, with shredded paper in between. Clothes hung in wardrobe cartons will arrive at your new home fresh and ready-to-wear.

mile over 25. For a four- to six-room house, an average of five hours is required for loading and perhaps as long for unloading.

4. *Start packing early.* Do a little at a time and the last-minute rush won't get you down.

5. *Take down all draperies,* blinds, curtains and their fittings. Movers charge extra to do this. Don't forget your TV antenna. Remove all carpet tacks, but don't take up the carpets or rugs. That's the mover's job.

6. *Prepare major appliances* for moving. What has to be done depends on the make and model. Reliable movers know the details, but the responsibility of checking ought to be yours. Here's some general information:

- TV sets. Be sure all chassis bolts are tightened. In some makes the picture tube needs special care.
- Refrigerators. Empty and defrost. With gas models, the gas line must be disconnected and capped.
- Freezers. Movers will not take loaded units on moves longer than 24 hours.
- Ironers. If the machine has a "shoe," be sure the shoe is tight against the roller to prevent moving or breaking. Tape any loose shelf or extension board to the machine.
- Clothes dryers. On gas ones, the line must be disconnected and capped.
- Washing machines. All automatics should be serviced before moving.

7. *Notify the post office,* utilities, and services both at your present address and at your new one. This is important if you want electricity, gas, telephone, and milk delivery at your new address on the day you arrive.

8. *Make plans for moving pets.* The mover won't. This also applies to plants, particularly in over-the-state-line moves where plant-disease laws may be involved.

9. *Estimate the value of your belongings* to obtain adequate loss or damage coverage during the move. While movers are "bonded and insured," the actual coverage provided may be very small compared with the actual worth of your belongings. In a move inside any one city, you may or may not have protection. The same is so of moves within a state. The laws of the state apply.

In moves from one state to another, ICC regulations usually limit the mover's liability to 30 cents a pound for each article. Thirty cents a pound doesn't go far in terms of fragile and valuable antiques. You couldn't even replace an unpainted chair at 30 cents a pound. Unless you're a gambler, take out transit insur-

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ance for the actual value of your belongings, usually at a charge of about 50 cents for each $100 of declared value.

Packing tips. When it comes to packing your belongings, here are well-tried tricks that save breakage and headaches:

- China and glassware: Pack in barrels or cartons, padding the bottoms with shredded paper. Wrap dishes in bundles of four or six with shredded paper in between. A sheet or two of newspaper will protect glassware. Fragile china, however, should be padded with cotton or some similar batting material.

When you put the pieces into a barrel, place the heaviest and bulkiest at the bottom, the lightest, most fragile pieces at the top. Spread generous amounts of shredded paper around each article or bundle, making the packing firm but not a tight squeeze. Pack dishes on edge, tumblers with the drinking edges down.

When a barrel is full, leave an inch or two of shredded paper on top before you put on the cover. If no cover is available, allow more space at top for shredded paper and cover with wrapping paper.

- Kitchen utensils: Pack in barrels or cartons. Wrap each item in newspaper and protect with shredded paper. Don't pack glass parts in with metal utensils unless well padded and protected.
- Books: Wrap each book in plain paper (newsprint will rub off and may ruin light-colored bindings). Pack in cartons. Place books on edge, alternating bound (back) edge to open edge—this makes a more solid, compact package.
- Phonograph records: Line bottoms of cartons with shredded paper. Place a piece of newspaper between records and wrap them in bundles of eight or 10. Place the bundles on edge but don't use shredded paper between bundles. Press shredded paper around sides of the carton to provide a cushioning effect. Set record albums on edge with the bindings alternating up and down, as with books.
- Linens and draperies: Pack flat along natural folds, in cartons. Protect with white tissue. Don't use newsprint; the ink will rub off. With draperies, place rolls of white tissue paper inside folds so materials won't be creased.
- Lamp shades: Wrap in white tissue, pack in strong cartons. Pack lamps somewhere else, not with the fragile shades.
- Food and drugs: Put them in *separate* cartons. First seal all open bottles with tape, then wrap and pad.
- Large mirrors, pictures: These travel best when crated.

Mark on each carton and barrel its general contents so the movers can place it in the right room.

Mark all containers holding breakables with large FRAGILE signs.

Placement drawings save time: Give your mover rough sketches of each room in your new quarters showing which carpet goes where and how the furniture should be arranged. He'll be glad to put the stuff exactly where you want it if he knows. Tag each piece of furniture to indicate the room. You'll probably do some shifting around to take care of second-guessing, but if the bulk of your furniture goes to the right places as it comes from the moving van, you'll have less muscle work later.

One of your most important jobs on M-Day will be to tell the movers what *not* to move. More than one householder, after watching the loaded van wheel down the road, comes to a sad realization: He didn't tell them *not* to load those suitcases stacked by the door—so there went the clothes, shaving kit and toothpaste that were to stay with the family on its own two-day trek to the new home. END

M-Day economics—what will it cost?

LOCAL move: For a rough estimate, figure about $35 a room plus $4 a mile for the first five, $1.50 a mile for the next 20, and $1 a mile for all over 25. This does not include charges for extra services (packing, barrels, etc.) or for insurance.

INTERSTATE move: Charges are based on tariffs filed with the Interstate Commerce Commission. These rates are figured according to the weight and the distance moved and they vary in different sections of the country. As a result, only an expert who knows all the facts can give a fair estimate.

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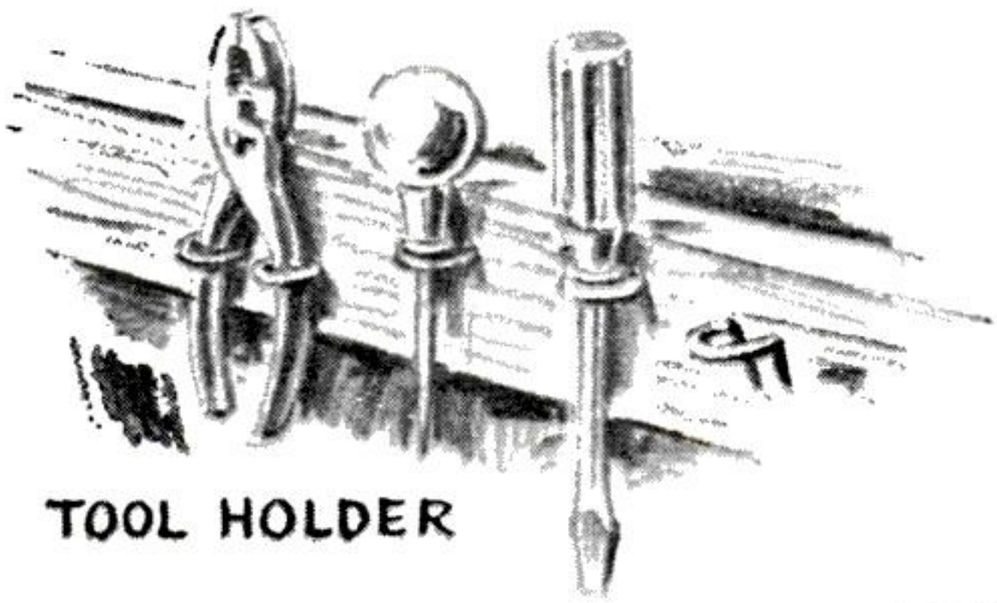
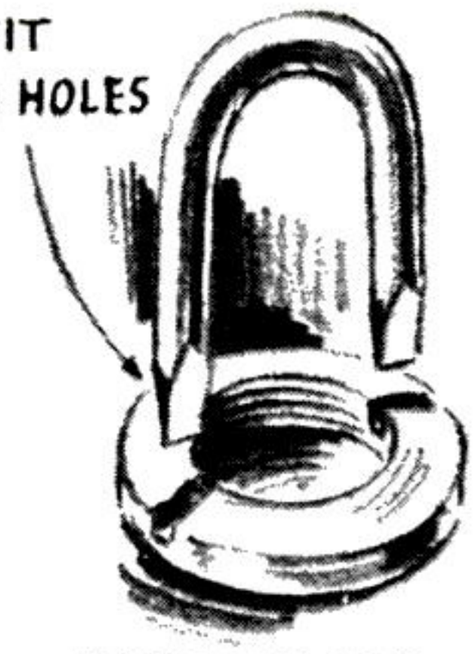
10 USES FOR Staples

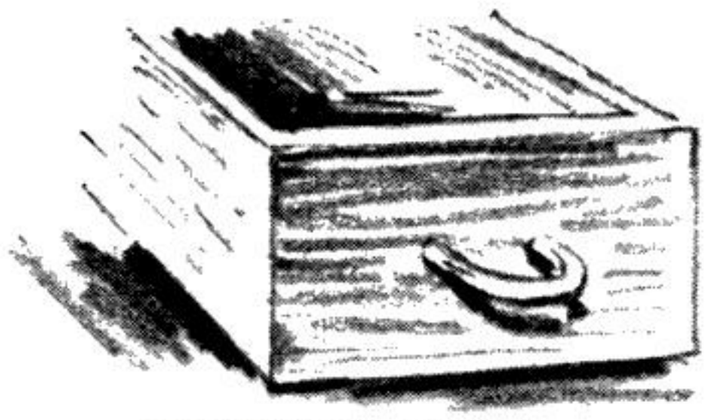
BENCH STOPS TO HOLD BOARDS BEING PLANED



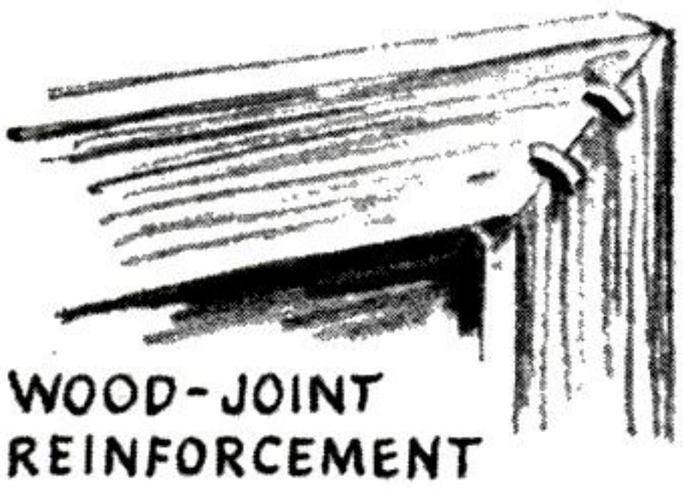
TOOL HOLDER

FILE TO FIT SLOTS OR HOLES



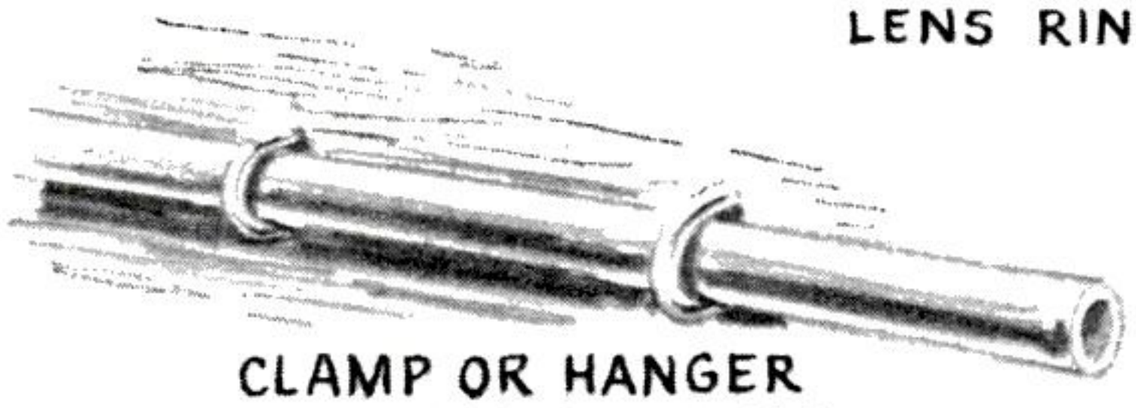


DRAWER PULL

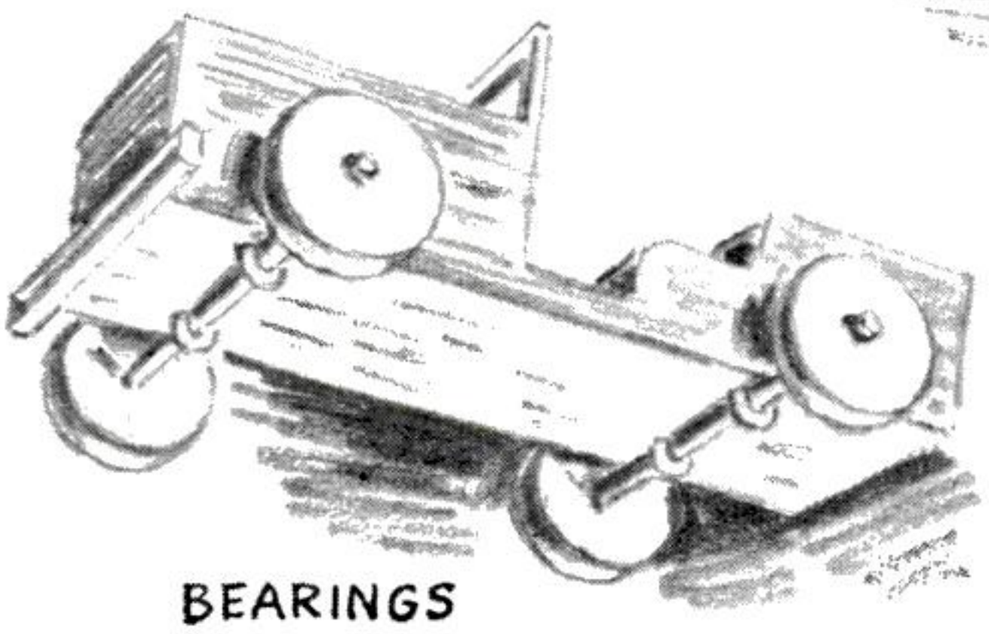


WOOD-JOINT REINFORCEMENT

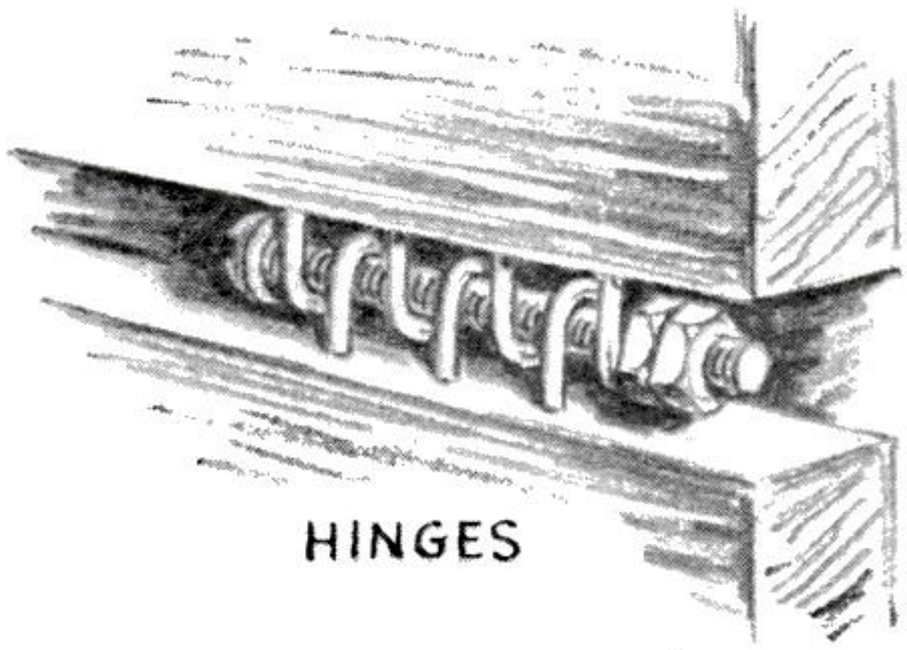
WRENCH FOR LENS RING



CLAMP OR HANGER FOR SMALL TUBING AND PIPE

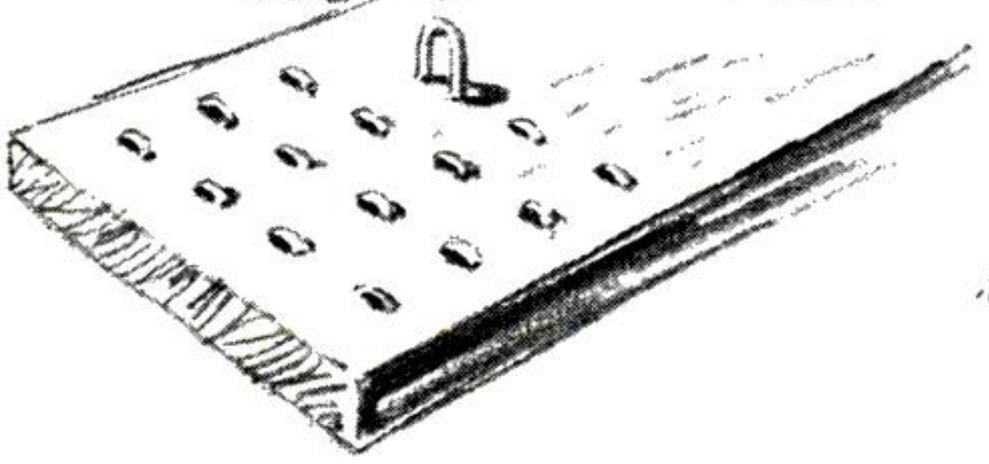


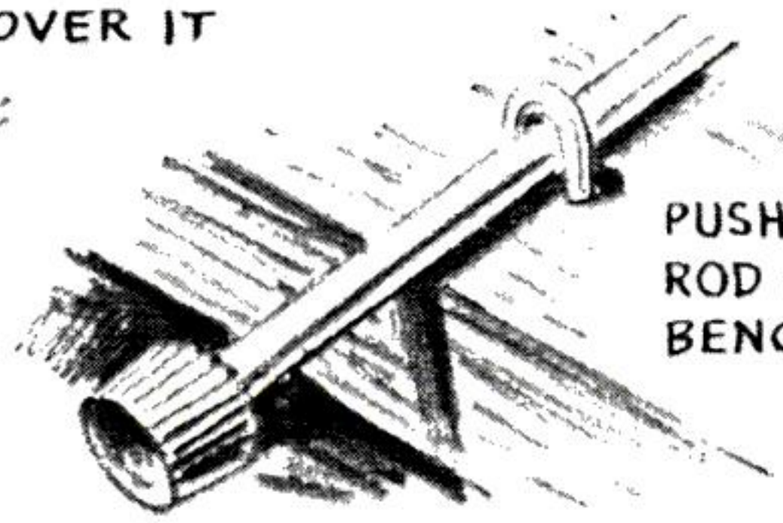
BEARINGS FOR TOY-CAR AXLES



HINGES

MANY STAPLES DRIVEN INTO WOOD INCREASE ITS WEAR RESISTANCE WHEN HEAVY OBJECTS MUST SLIDE OVER IT





PUSH-PULL CONTROL-ROD GUIDE, AS FOR BENCH-TOP SWITCH

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Here's valuable information about a modern convenience—

Timely Facts About Automatic Faucet Sprays

YOU press the thumb control of an automatic faucet spray, and the stream of water pouring into the kitchen sink suddenly switches from the swing spout to the spray head. Why? What happens? Why doesn't the water just dribble from both spout and spray?

The answer is a convenience of modern living—an ingenious mechanism called an automatic diverter valve that many manufacturers build into kitchen faucets.

Nearly 20,000,000 kitchen faucets equipped with automatic sprays are now in use in American homes. If you haven't yet encountered such a spray, or been called upon to trouble-shoot one, you can expect that sooner or later you will. You'll know it as an automatic by the on-off thumb lever.

Since automatic faucet sprays first came into widespread use shortly after the war, around 10 years ago, a great many are in need of attention now, or soon will be.

Repair and replacement of the sprays, until recently, has sometimes been troublesome. With 42 faucet manufacturers in the picture, dozens of different sprays and hoses were available for replacement. For the individual, that has often meant difficulty in finding the required part or replacement.

An industry-wide program of standardization has overcome the problem. Eight replacement items are standard. Choosing from these, you can replace any part of the spray system of any kitchen faucet ever made with an automatic spray. The standardization program is being supervised by the Automatic Spray Service Center, 1700 E. 58th Place, Los Angeles 1.

Spray heads of five or more shapes are supplied with new faucets; but standard replacements include just two—a spray

BRUSH-TYPE SPRAY can be installed in any sink equipped with automatic spray. Cup-shaped hose guide at right can be substituted for old flat one at left. New guide keeps spray upright and collects any dripping water.

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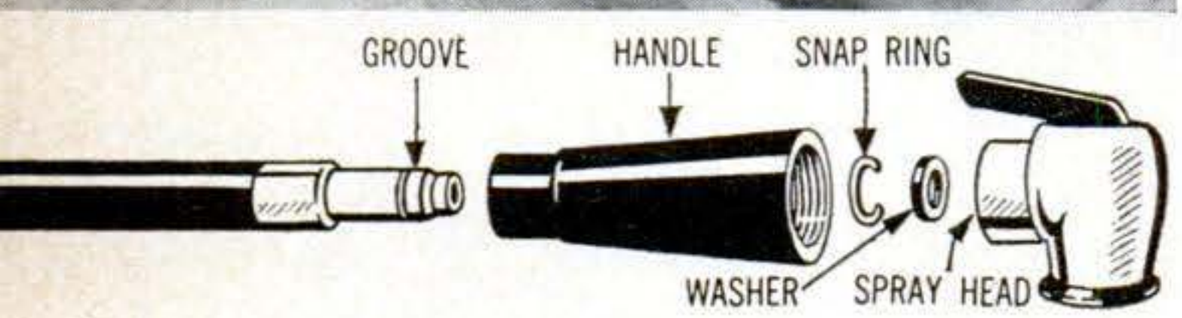
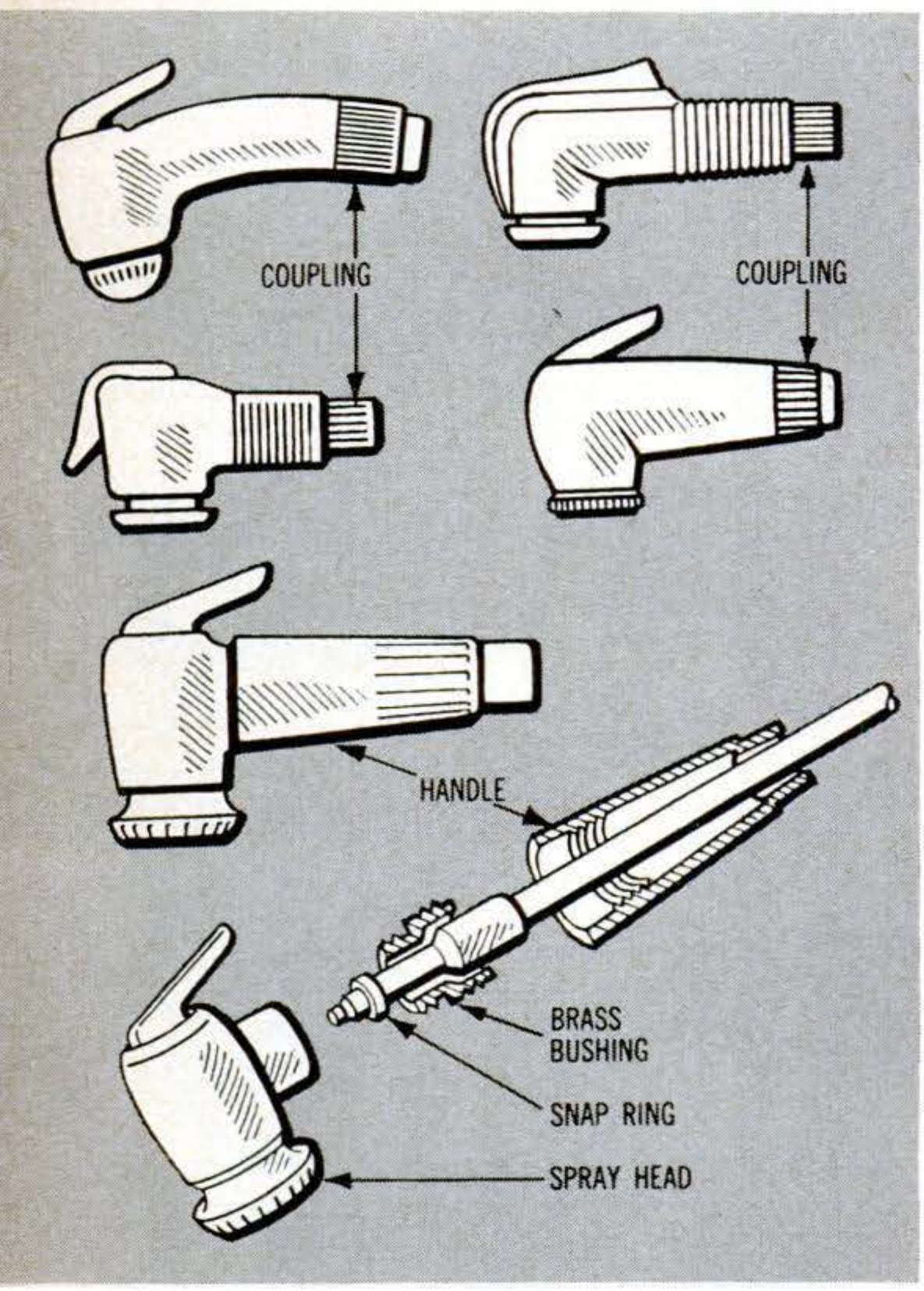


STANDARD RINSE SPRAY for replacement use goes together as shown. Brush spray on the preceding page has a coupling inside handle.



FIVE TYPES OF SPRAY HEAD, shaped as shown, are furnished as original equipment with automatic-rinse sprays. To detach the four types at top, unscrew the coupling. A wire snap ring will then be visible in a groove on brass hose fitting. Pry it off and slip coupling off. If you have the type at lower left, unscrew handle, then pry off the snap ring. On some models of this spray, you must also unscrew a brass bushing. Latter head is chromium, others are plastic.

for rinsing only and a dishwashing spray that suds, scrubs and rinses. Other replacement items include improved hoses with couplings to fit all connections, hose guides, brushes and diverter valves.

Automatic sprays use diverter valves of three or four different types, but all work on the same principle.

A diverter valve does its job through water exerting force against surfaces of different size. The larger the area, the more force is exerted. From this, it's understandable that anything that changes the usual water-pressure balance may upset the operation.

Sediment collected inside the spray nozzle, inside an aerator on the swing spout or in the diverter valve is a common cause of trouble, and periodic cleaning should be the rule. Clearing out the foreign matter is a simple operation.

New hoses. Replacement hoses come in 30″ and 4′ lengths. Use the former for wall-mounted faucets and the four-footers for ledge- or deck-mounted types. All hoses have standard fittings for the spray, a universal coupling at the other end that lets you tie on to any one of the three types of connection you may find under the diverter valve in the faucet fixture. Hose replacement is easier on sinks with deck-mount faucets if a pipe nipple is installed underneath to bring the point of hose connection down lower where it can be reached.

New spray installations. You should remember that a faucet with an automatic diverter valve is the first requisite if you want to add an automatic spray to a sink that doesn't have one. If it's a four-hole sink you have a choice of putting the spray either to the left or the right of the faucet. Standard position is on the right, but a left-handed dishwasher might have a different notion. Either way, have the drain

To keep an automatic spray working satisfactorily, follow the instructions given in the data sheets on the next two pages. These are designed for removal from the magazine and saving in your own personal binder. A Fix-it File appears in POPULAR SCIENCE each month.

Next Month: Doorbells.

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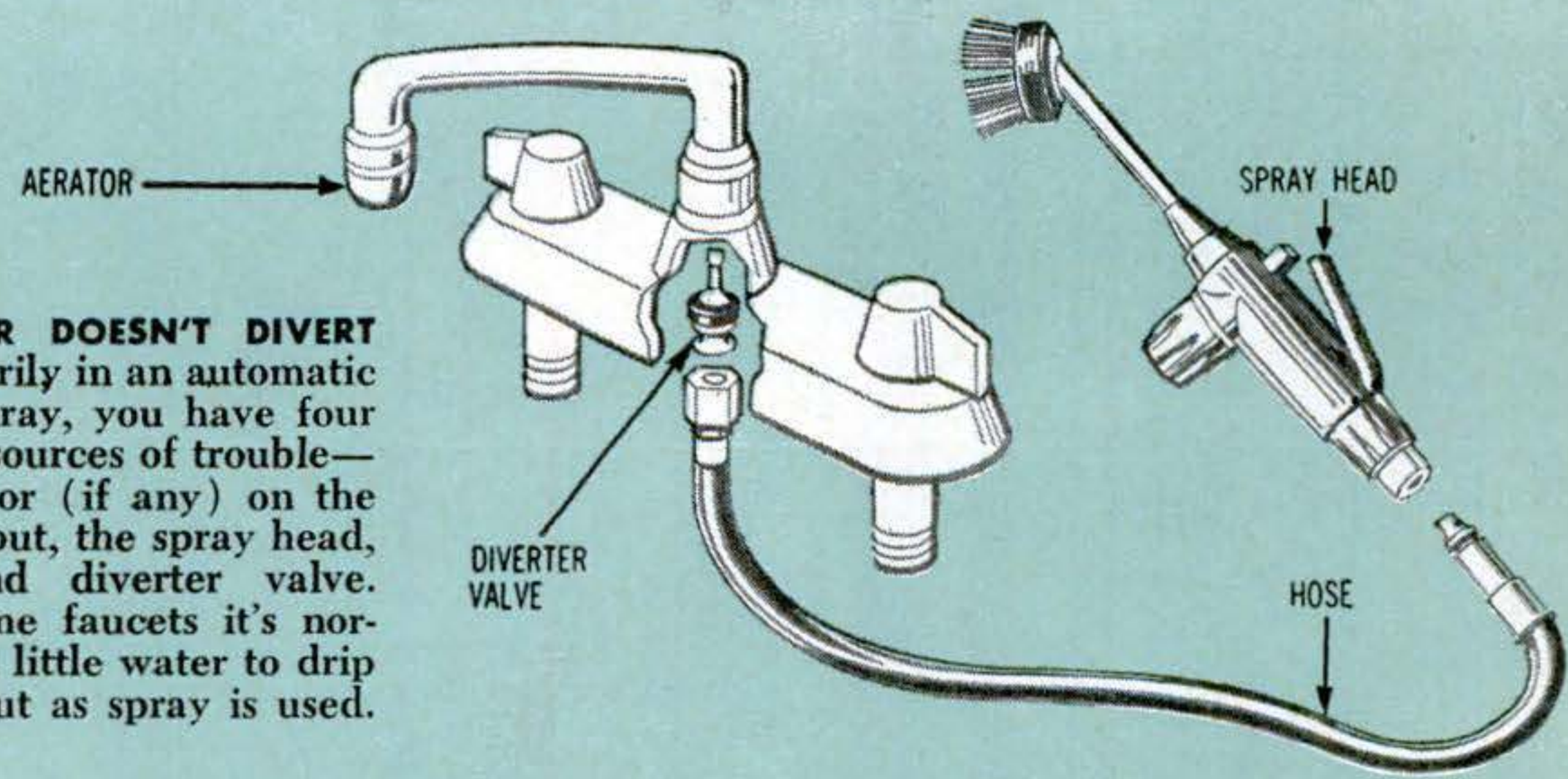
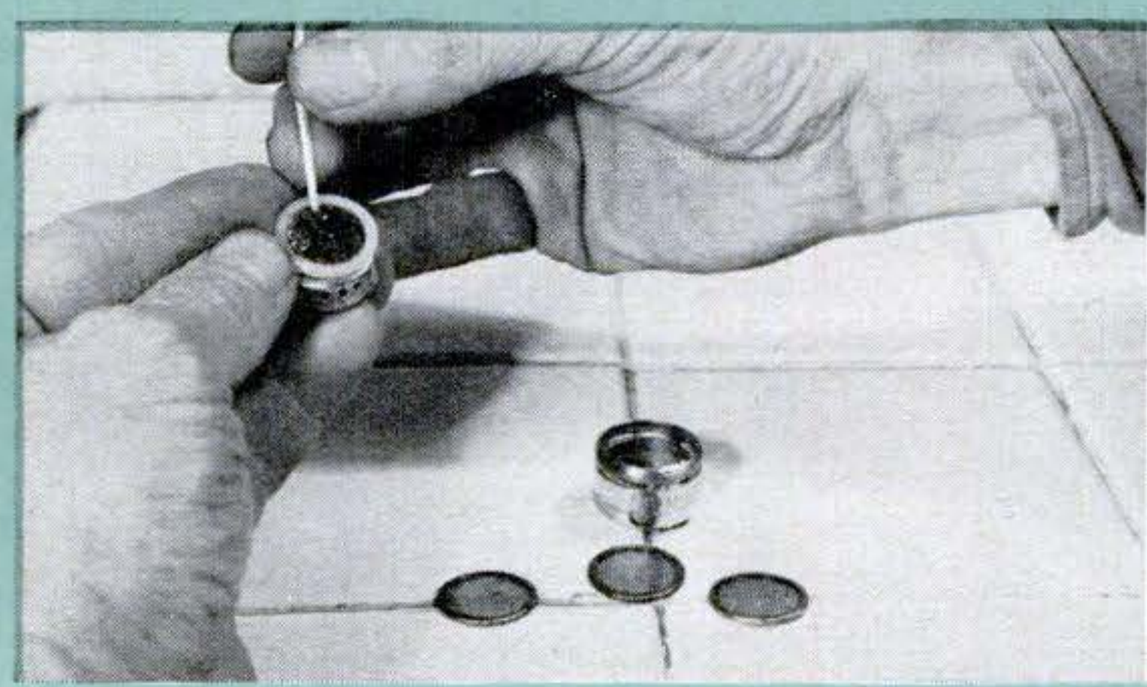
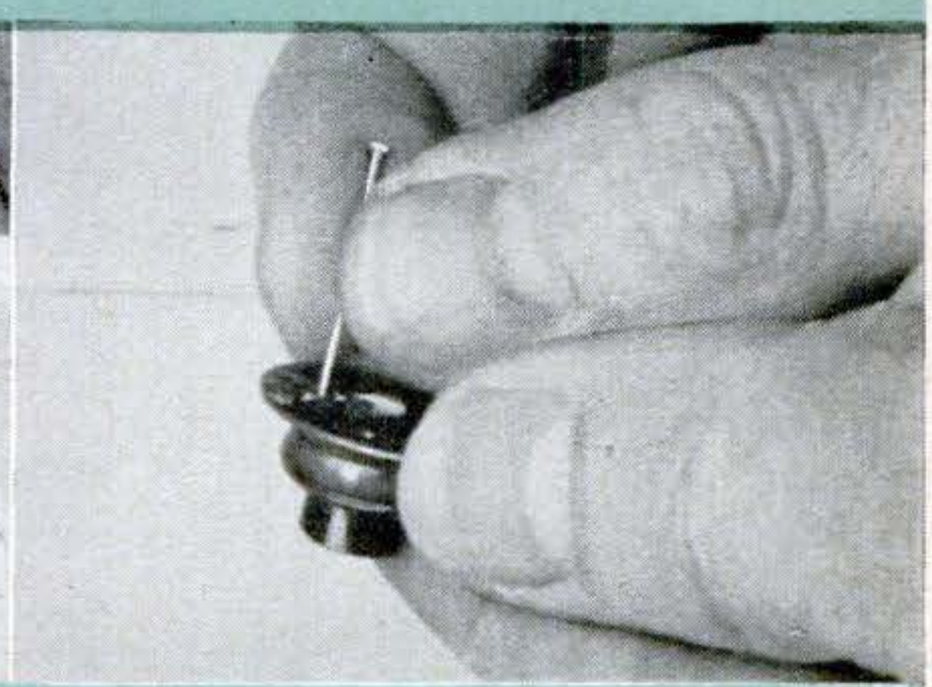
Faucet Sprays



IF WATER DOESN'T DIVERT satisfactorily in an automatic faucet spray, you have four possible sources of trouble—the aerator (if any) on the swing spout, the spray head, hose, and diverter valve. With some faucets it's normal for a little water to drip from spout as spray is used.

1 *Check the aerator first*

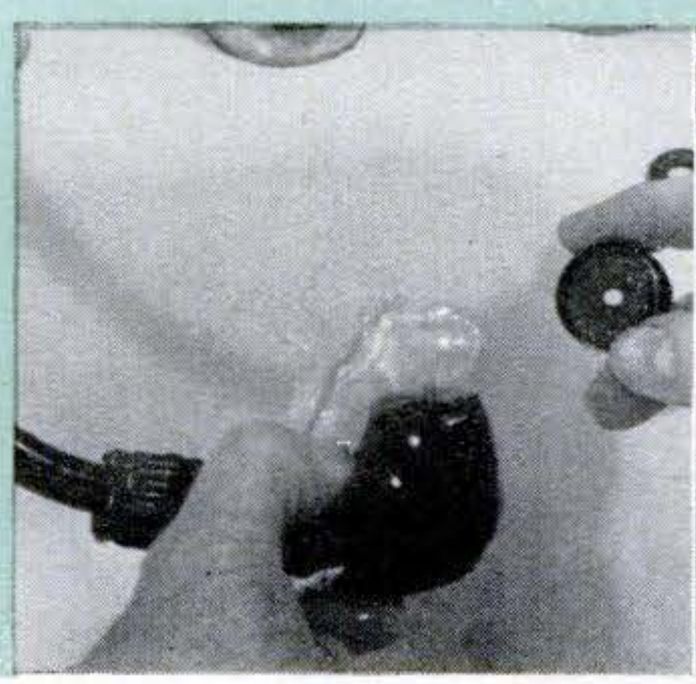


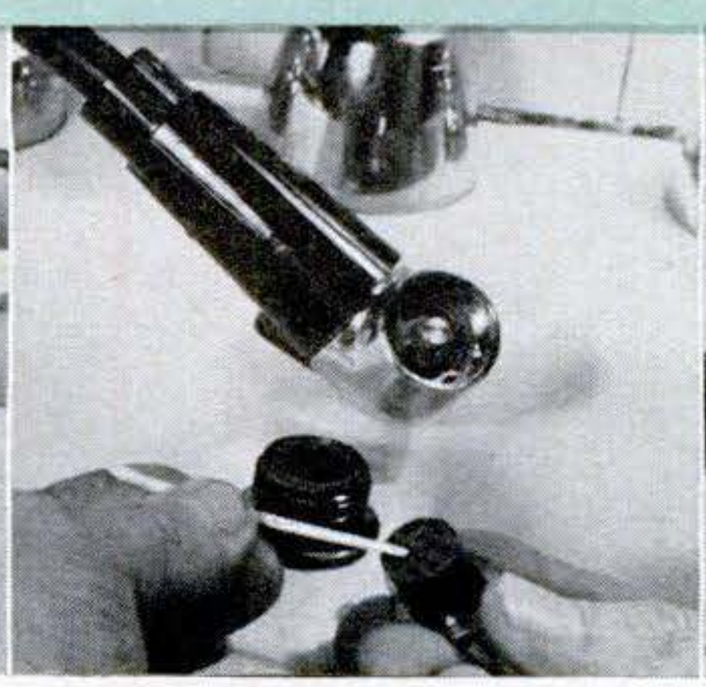


CLOGGED SCREENS in an aerator nozzle attached to a swing spout may create an imbalance of water pressure that prevents diverter valve from working. Remove aerator and clean openings with a toothpick, pin or brush. Then flush thoroughly with clean water and reassemble unit. Two types of aerator are shown above.

2 *Then clean the spray nozzle*

REMOVE NOZZLE of single-hole-type spray (below, left) and make sure hole is open. Depress thumb control and run water through head to flush out sediment. With multiple-hole sprays like the ones at center and right, below, remove nozzle or rubber head, depending on type, clean out openings, flush and reassemble.





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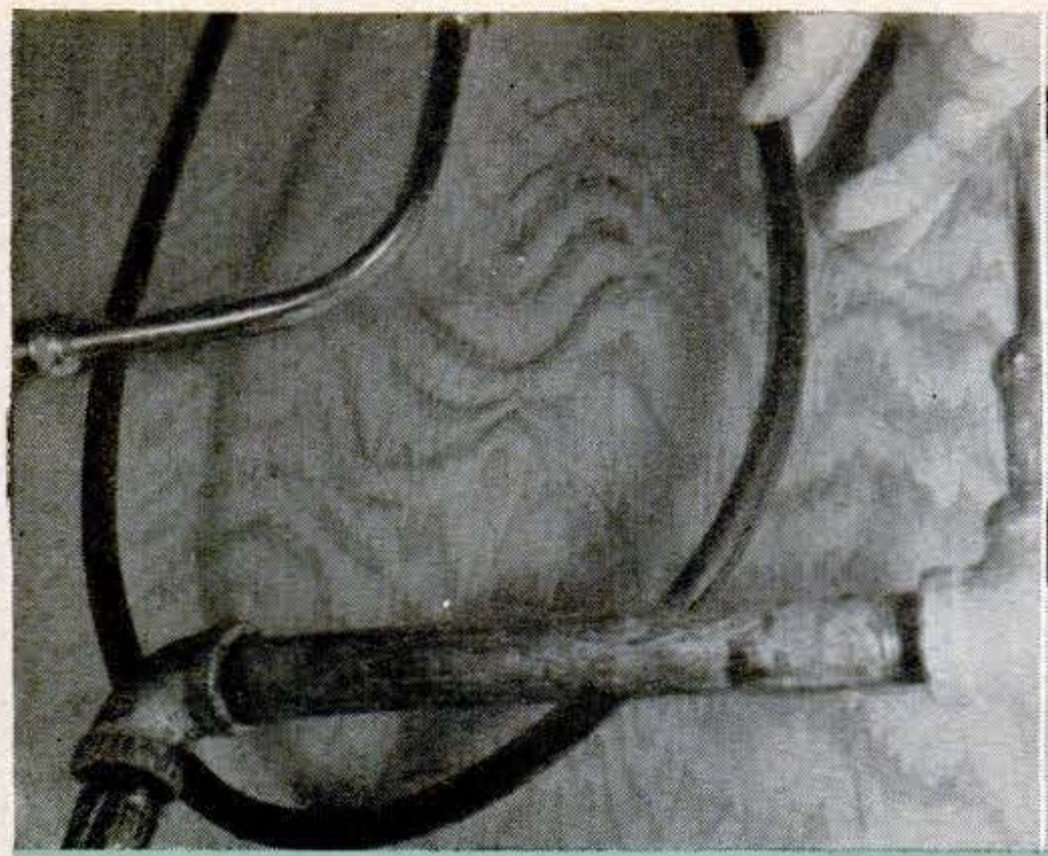
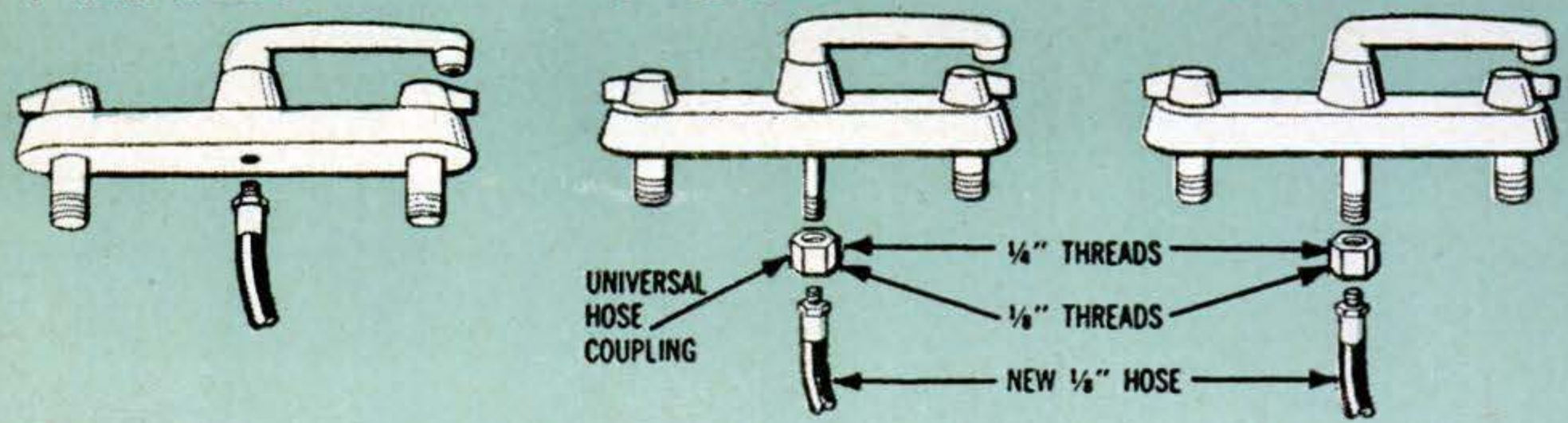


3 Next, check the condition of the hose

A KINK OR LEAK IN THE HOSE is sure to knock out a faucet spray. So when trouble occurs, check the hose under the sink to be sure it is hanging as free as possible of all pipes. If a new hose must be installed, see whether your fixture has ⅛" female, ⅛" male or ¼" male threads for the hose connection. Replacement hoses have a ⅛" male connection at faucet end. Each comes with a universal coupling (see photo above) so you can connect it in one of the ways shown below. Coupling has ¼" female threads in one end, ⅛" in the other. For a faucet with a ⅛" male connection, as at center below, the coupling is slipped over the connection, all the way through the ¼" threads, until the ⅛" threads engage at middle of coupling.



4 Trouble-shoot the diverter valve

WRAP COUPLING at base of swing spout with tape or cloth and back it off with wrench to release spout. Lift out diverter valve with tweezers (in some faucets a bushing must be removed first). Clean valve with a toothpick or brush. Before reseating valve (with stem up), put spout back on temporarily and flush hot and cold water through pipes. If you find valve damaged, get replacement from a plumber or write to Automatic Spray Service Center, 1700 E. 58th Place, Los Angeles 1, Cal.

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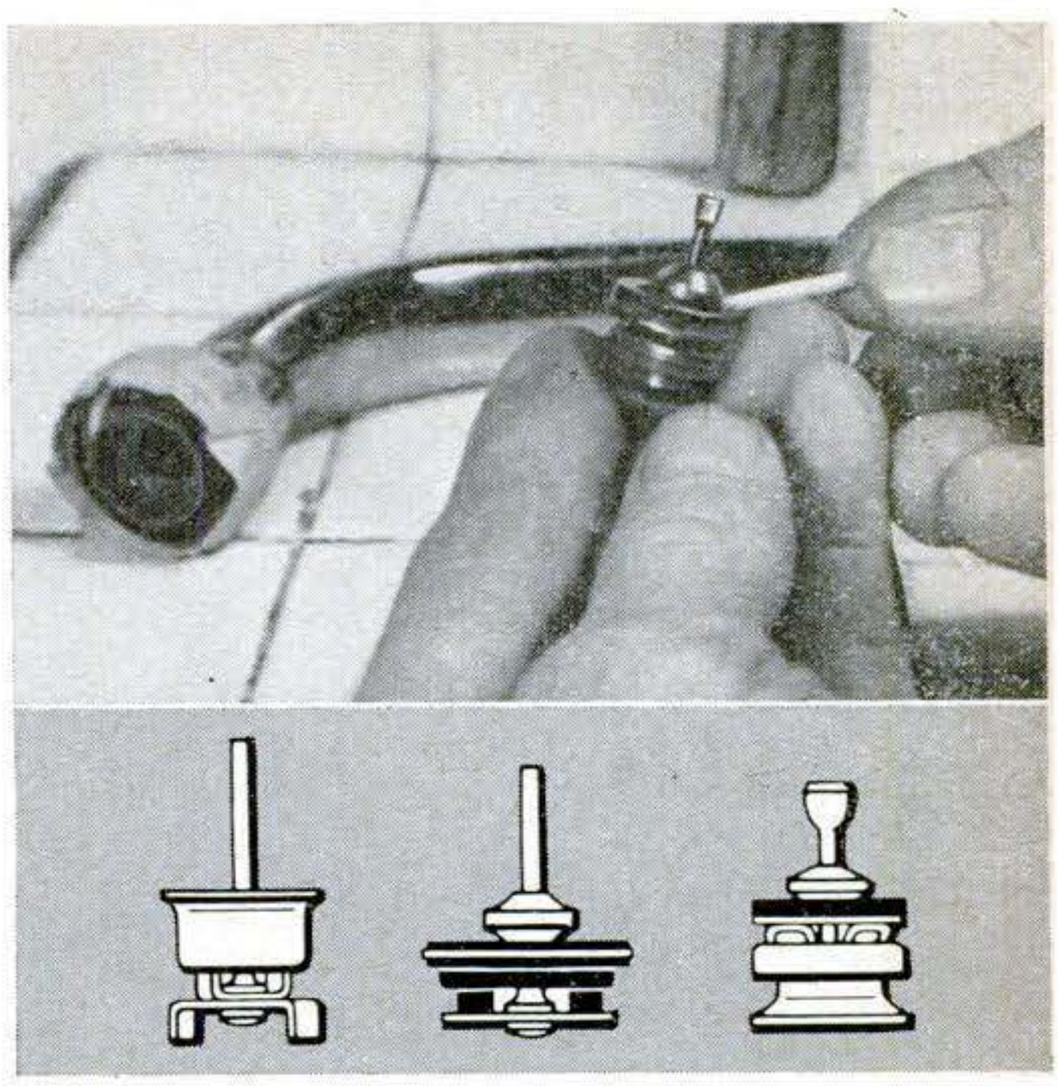
and water pipes in the under-sink area all plumbed on the side away from the hose and spray. A fourth hole must be drilled in a three-hole sink if you want to replace an old faucet with any of the more common diverter-valve-equipped faucets. If your sink is made of porcelain, leave the hole-drilling job for an expert. Or, easier, buy a single-lever faucet fixture of the type that doesn't need a fourth hole for the spray.

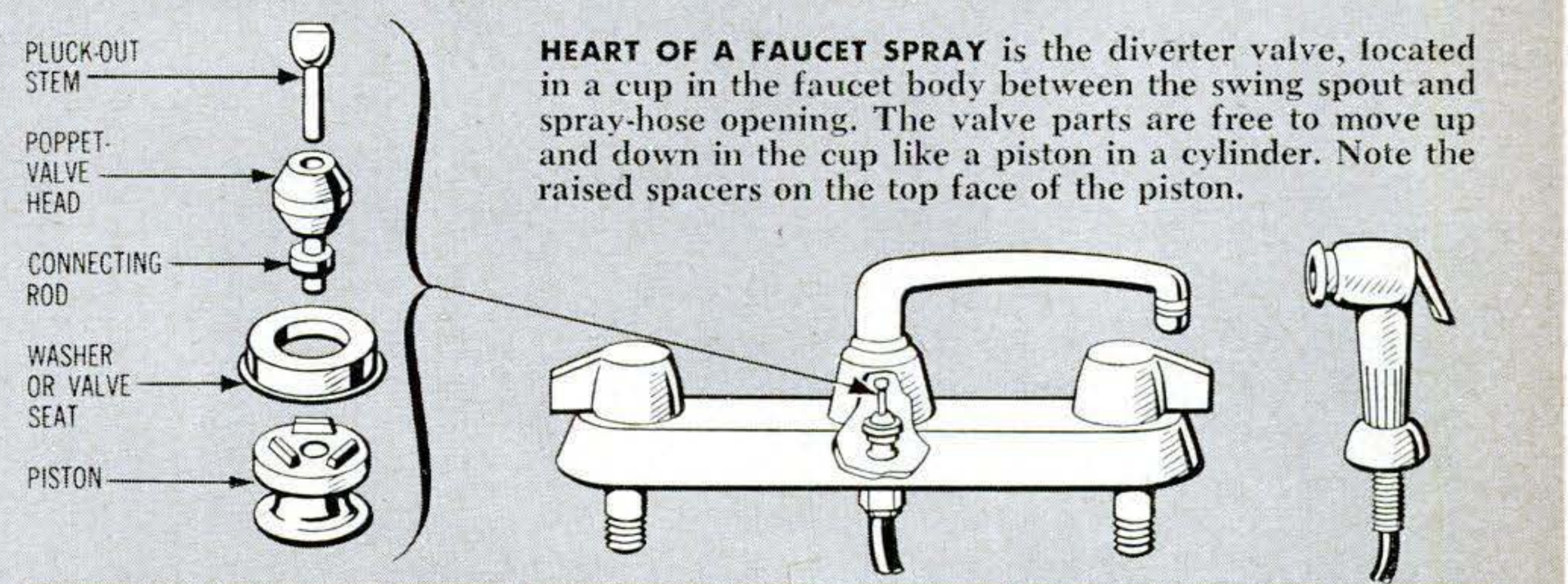
If your old faucet is mounted on the wall, as many are in some parts of the country, your sink will have holes in the deck. You can buy a new spray-equipped faucet in either the new single-lever type or in the familiar type with separate hot and cold taps.

After installing a new faucet, make sure that all bits of pipe compound or other foreign matter are out of the lines or the diverter valve may not work. END

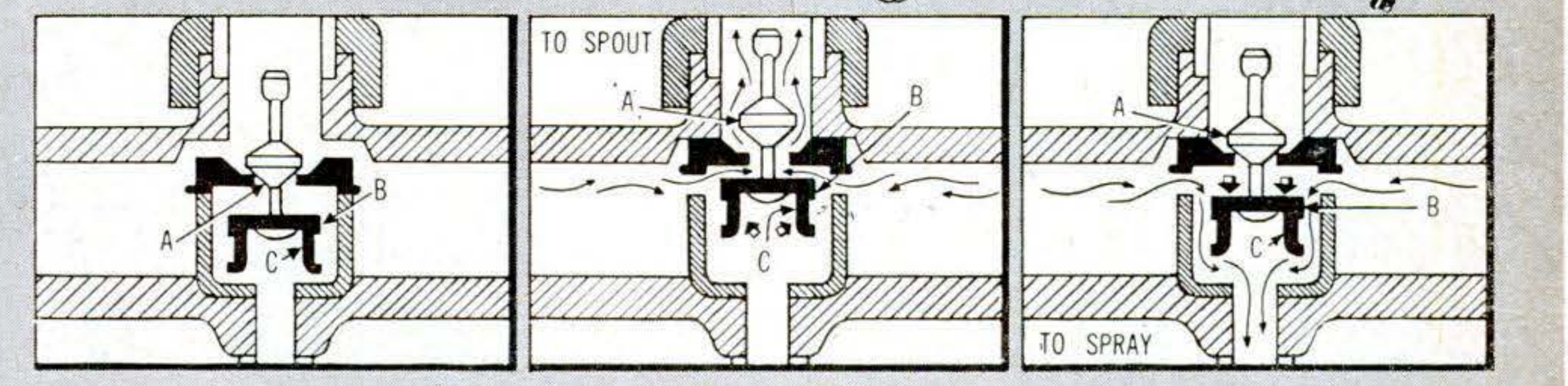


AUTOMATIC DIVERTER VALVES are made in the three shapes pictured in the drawing, but all use the same principle to divert water flow.

How a diverter valve does its job, automatically



HEART OF A FAUCET SPRAY is the diverter valve, located in a cup in the faucet body between the swing spout and spray-hose opening. The valve parts are free to move up and down in the cup like a piston in a cylinder. Note the raised spacers on the top face of the piston.



WHEN TAPS ARE OFF, the valve parts come to rest like this in the cup. Note that the valve head and piston are a single unit, free to rise and fall independently of the washer. The top surface of the piston (B) and the bottom surface of the piston (C) are designed to have equal areas.

TURN ON TAP and water flows to the swing spout. The valve parts are lifted by the upward water pressure against valve face (A) and the piston bottom (C). As long as the valve head remains up, water can pass between spacers on the piston top, through the washer and into the swing spout.

WATER DIVERTS to the spray automatically when you press thumb lever. Opening the spray bleeds off the pressure against (C). Because surface (B) is greater than surface (A), pressure against (B) snaps the valve head down into its seat, shutting off water to the spout, sending it to spray.

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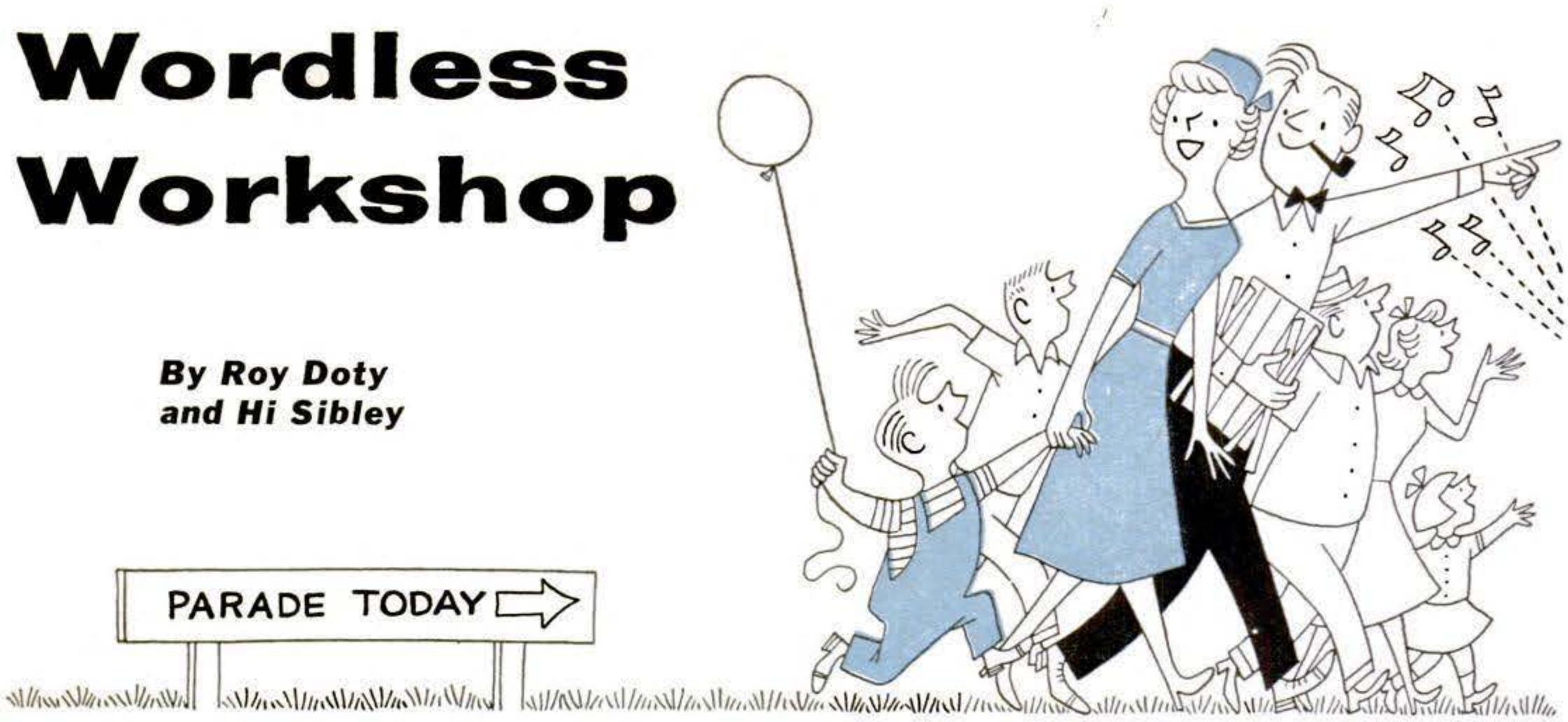
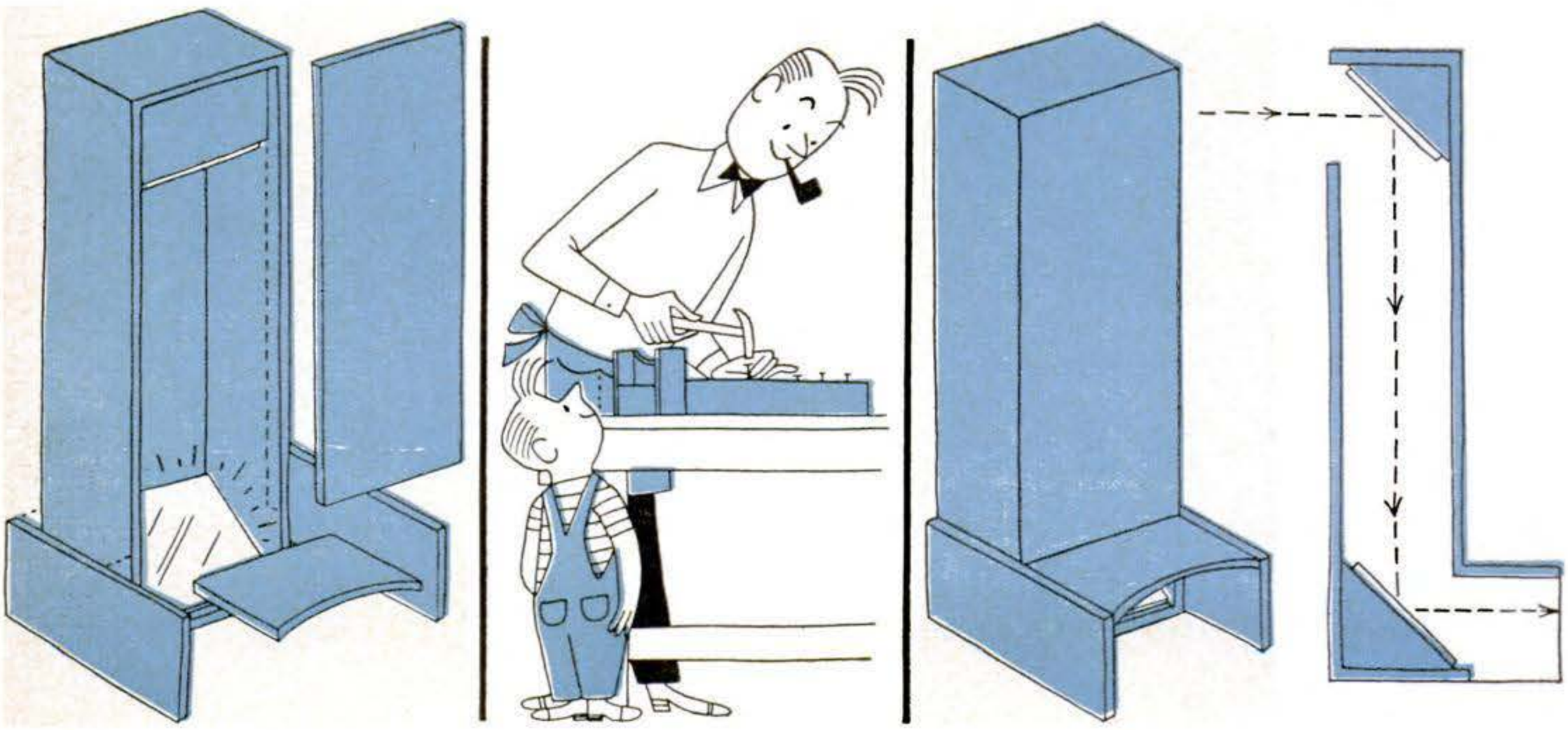
Wordless Workshop

By Roy Doty and Hi Sibley





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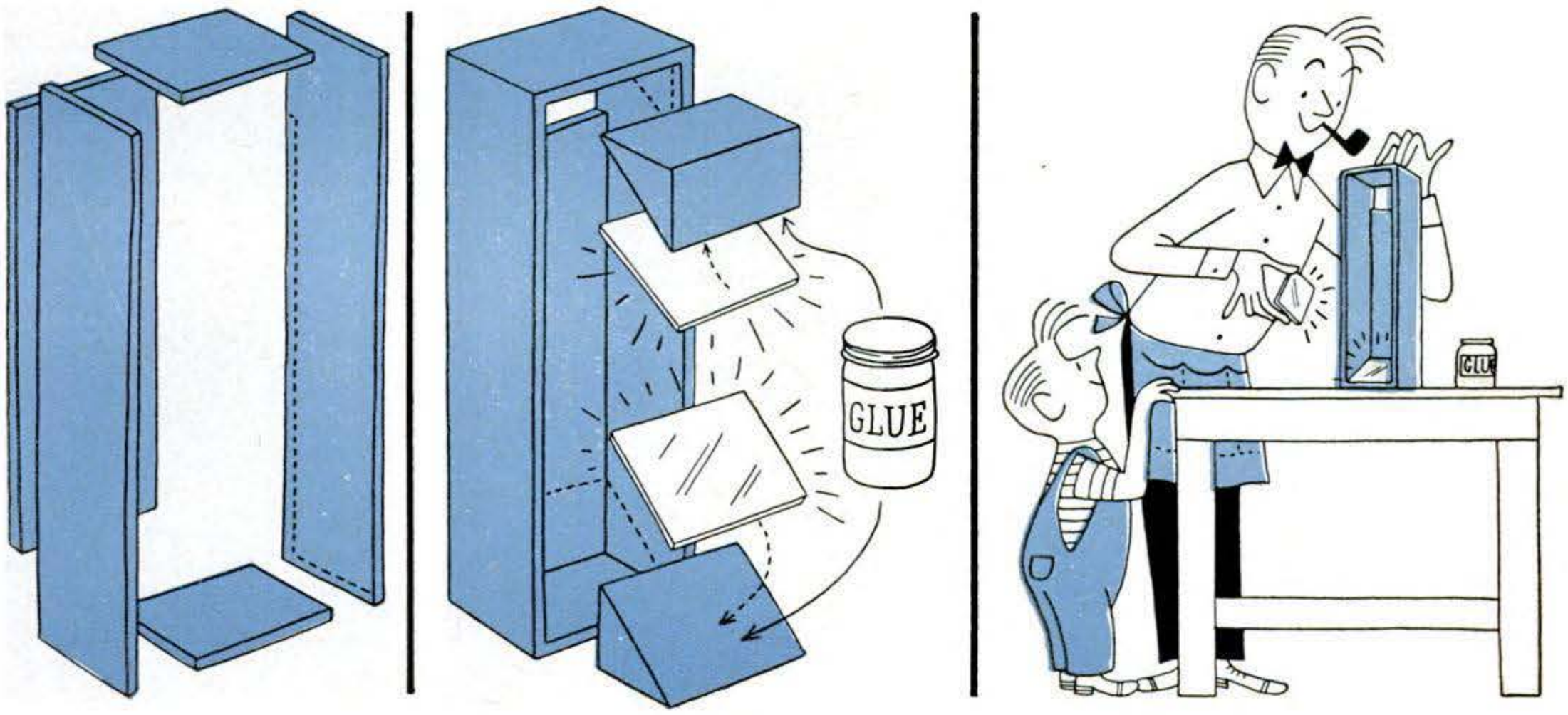

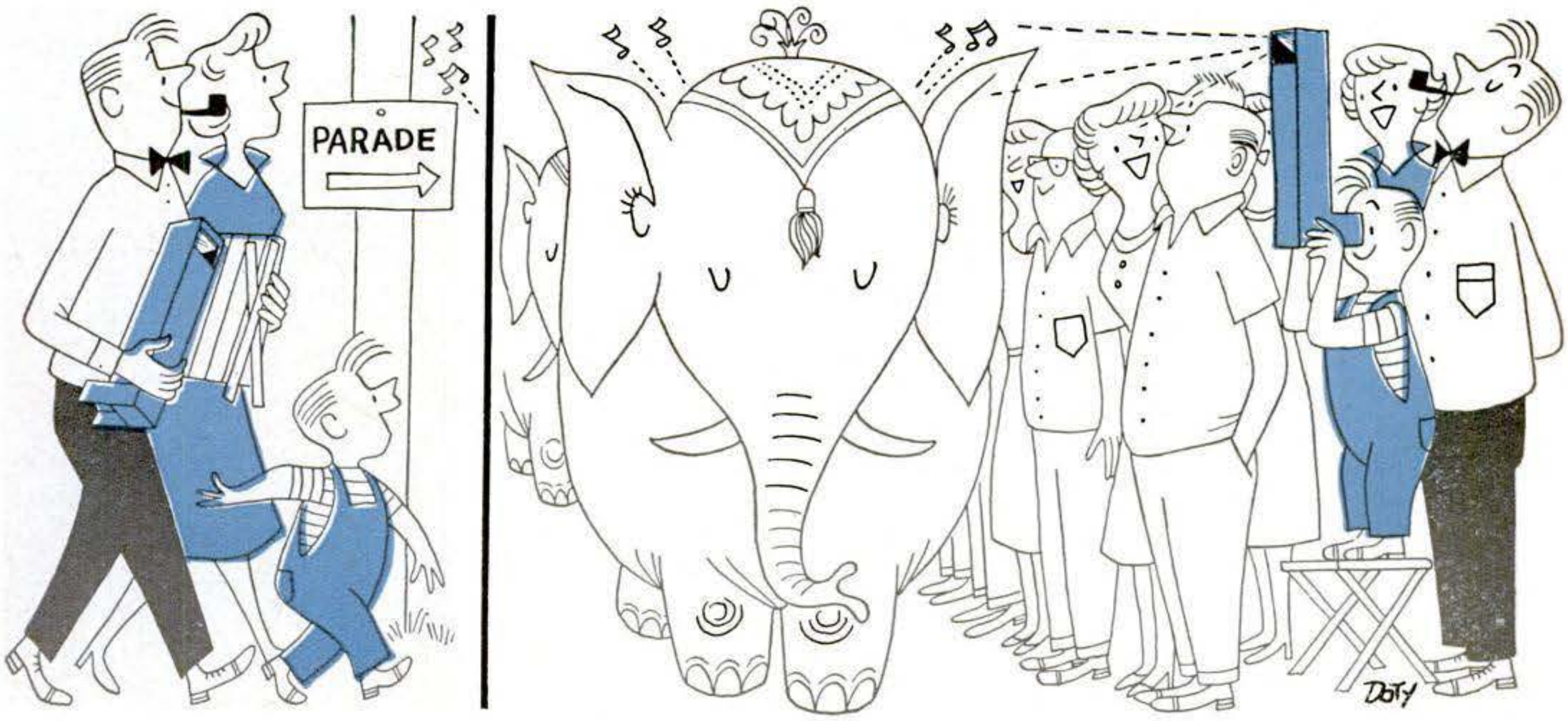

Next Month: A bottle rack with built-in opener and cap catcher

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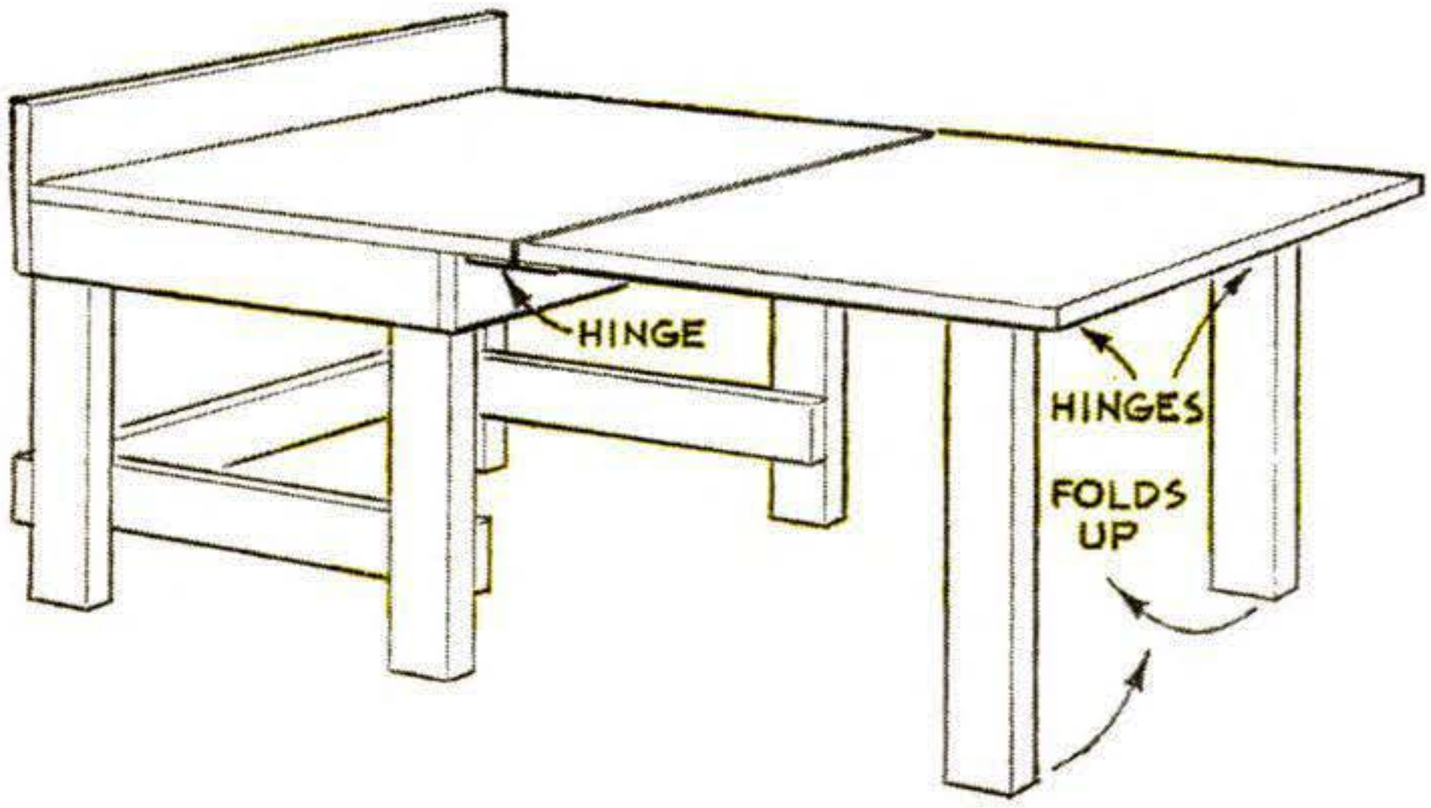
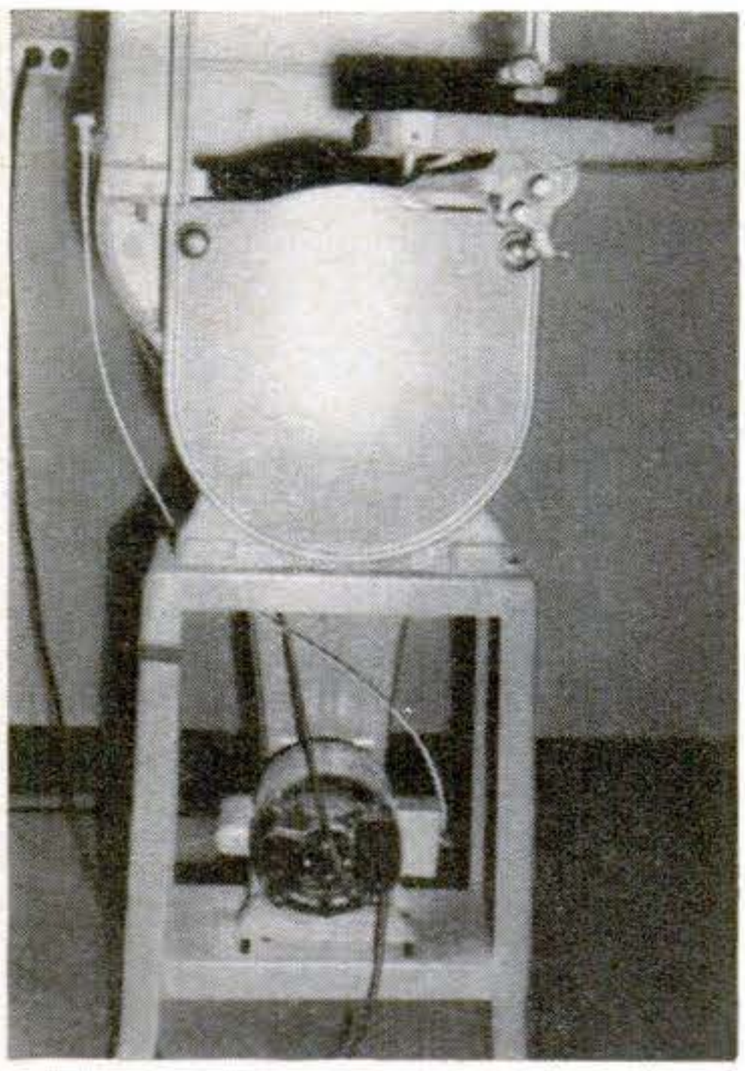
The POPULAR SCIENCE Shop Notebook



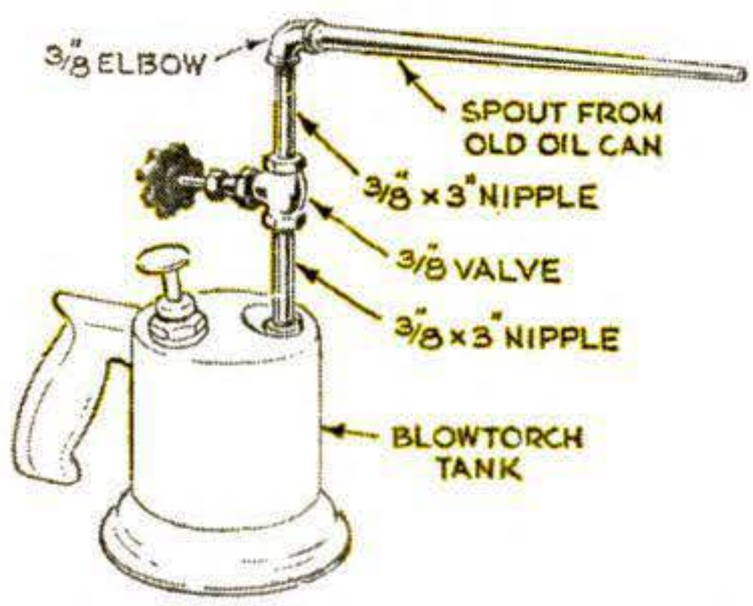
Stretch a shop bench with a small working area by hinging a drop leaf to its side or front. Folded down, the extension is out of the way; set up and supported by hinged legs, it provides a sturdy work surface for handling the big jobs.—*Robert A. Pollock, Staten Island, N. Y.*



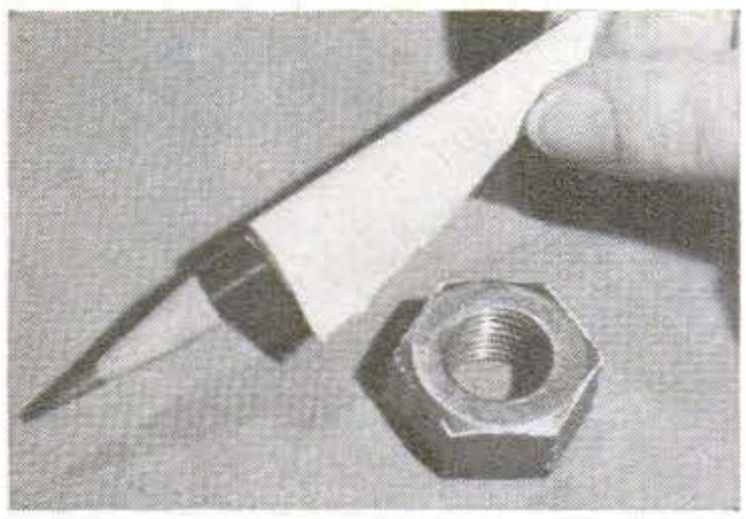
A hard-to-reach switch on a power-tool motor can be turned on and off from a more convenient location with a choke cable bought at an auto-parts supply store, or salvaged from a junkyard. Arrange the cable hookup so that when the knob is pulled up the motor starts, and when it's pushed down the motor stops.—*Robert S. Tupper, Canton, S. D.*

A seeping oilcan can mess up and stain your workbench. Keep it in its place inside a metal jar lid fastened down, out of the way, with a small nail or screw. —*W. F. Shanner, Evansville, Ill.*

Even a slim pencil may be too fat to fit into some pilot holes for marking a screw or bolt start. Try using the refill cartridge of a ball-point pen. It will enter very small holes.—*E. R. McCafferty, Naches, Wash.*



Old blowtorches never die; they become pressurized oilcans. Simply remove the old jets and burner, and install some copper tubing and a valve. Assemble the new tubing in the pressure chamber and solder the tapered spout from a hand oilcan in place of the "L" fitting. Fill the pressure chamber with oil and operate the air pump a half-dozen times. Oil will flow freely out of the spout whenever the burner valve is opened. —*Edward Beach, Columbus, Ohio.*



Counting threads-per-inch in a nut or a hole is no problem if you make an impression of the threads on paper wrapped around a pencil. Press the paper firmly against the side of the threaded hole, remove it and measure the marks with a ruler or a thread gauge. For small-diameter threads, twist tightly rolled paper in the hole, then back it out, to bring out the impression. —*Frank A. Javor, Newark, N. J.*

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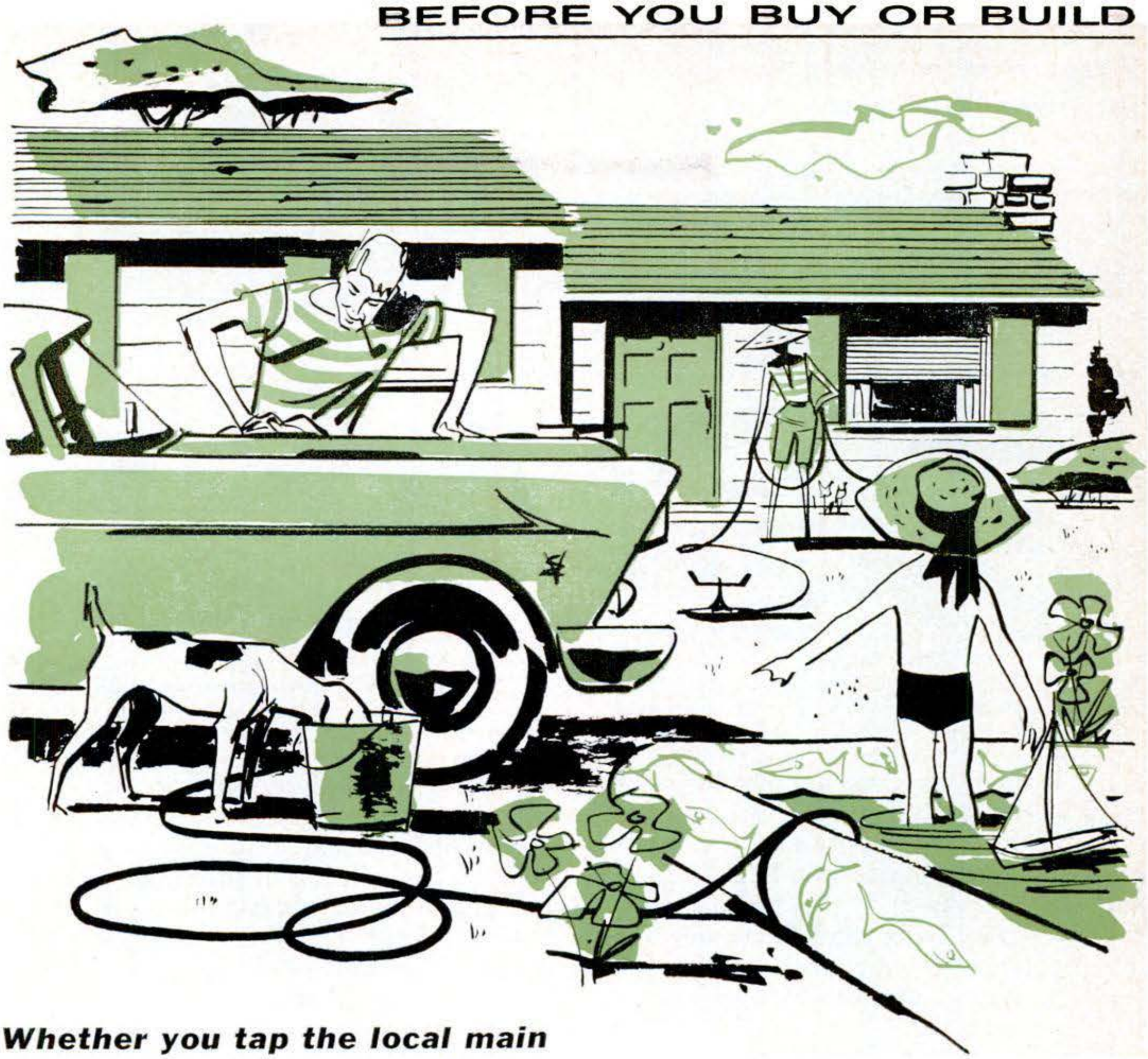

Whether you tap the local main or go to a well, the question is:

Will There Be Water for Your House?

By Herbert O. Johansen

ALL over the nation there is a great movement of families toward "country living" in undeveloped areas beyond the suburbs. Power and telephone lines follow them; gas can always be bought by the bottle. But what about water?

It is probably the most important single factor to consider before you decide to join this trek into the hinterlands. Water is a problem today in many cities and suburbs. When you go farther out, even if you are lucky enough to be able to tap a water main, don't take your supply for granted. Check up on the local water facility to find out if it has the reserve capacity to service a growing population along with new industry that is seeking its own corporate green pastures.

If the prospect doesn't look very prom-

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Next month: "How Nature Can Help You Plan a House"—and save you money. This article shows you how easy it is to take advantage of the sun's heat in winter and cooling breezes during the summer.

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7 tips that can help you in your search for water

Even in areas of water plenty, you may find islands of scarcity. No rules will guarantee you a water strike when you drill. It's almost always a gamble, but that doesn't mean you have to go ahead with the dice loaded against you. Here's how to give yourself a better break for your money.

Talk to old-timers and bring up the subject of water casually. You'll learn something.

A stream that flows all year is a good sign of underground water; so are swamp areas.

In regions of dense rock outcroppings you are strictly on your own. It's hit or miss.

ising, it might be wise to consider a well right at the start, instead of waiting until demand outpaces supply and the torrent at your taps dwindles to a trickle. It can and has happened.

Or you may be beyond the water main. Then you are on your own for water from scratch—and in almost every case a well will be your source.

When you go to a well for water you are tapping the nation's largest storage reserve of fresh water, far greater than the capacity of all surface reservoirs and lakes, including the Great Lakes. It has been estimated that today there is an accumulation of ground water equal to 10 years of rainfall and snow.

Unfortunately, this vast supply is not evenly distributed. Even in areas of surplus, water is not always where you look for it. A plentiful supply may become meager or even dry up without warning. In many parts of the country water tables (level of underground water) are falling —not only during periods of drought when it is to be expected, but during years of heavy rains. In some populated areas more water is being pumped out than nature is able to put back into the ground.

Large industrial wells, such as those used by some big breweries, and widespread irrigation are doing their share in depleting our underground water. Then, new manufacturing processes with terrific thirsts and the expanding water systems of big cities are intercepting, consuming, using and contaminating billions upon billions of gallons as *surface* water, some of which would otherwise seep underground to replenish depleted groundwater supplies. More and more people and machines are using more and more water—and wasting it.

A man with a large-capacity well on his property may not be concerned with newspaper headlines telling of shrinking reservoirs that supply a nearby metropolis. But it is all part of the overall water picture. The water in his well comes from the same source—rain and snow.

The few hundred gallons a day you'll need isn't even a drop in the national bucket, but without it you'll be a mighty unhappy homeowner. On the other hand, your own private, automatic system may supply you with water just as lavishly, dependably and inexpensively as the average municipal system—and without the chlorine taste.

Whether you are thinking of an old house with an existing well or are planning to build and drill at a new location, there are simple precautions you can take. They won't guarantee you a constant and ample supply of good water but they will

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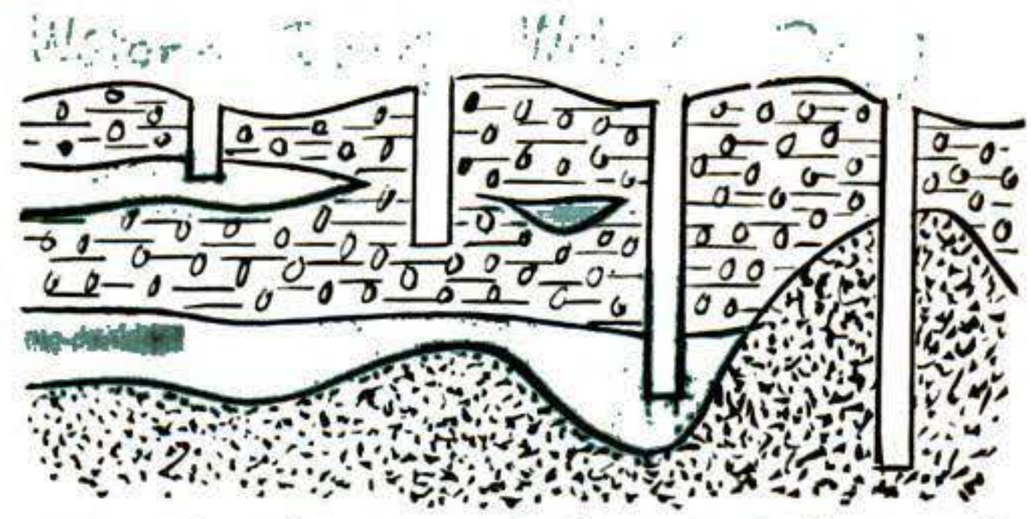
State or county water authority will have facts and figures on the local situation.



Water is where you find it. A shallow well next to a deep, dry hole may give plenty.

In arid areas, learn about the special grasses, shrubs and trees that indicate water.

Before picking your man, interview several well drillers. You may get some good tips.

increase the odds against shortages—or even no water at all.

Drilling is more or less of a gamble. The ideal way would be to drill before you buy. It isn't usually feasible, however, and it's certainly expensive if you don't strike water. The next best thing is to do some water snooping on your own.

Ask the old-timers about the local water situation before you invest money. That's what the experts do, says one of the country's top consulting ground-water geologists, James J. Geraghty of Geraghty, Miller and Hickok, New York City. He warns, however, that favorable reports can be taken as a definite go-ahead-and-drill signal only in parts of the country that have adequate rainfall and good underground, water-bearing beds of sand and gravel, or limestone. In New York's Long Island, or most of Florida, for instance, you don't even have to ask. Just go down anywhere and you'll get water.

In regions where dense rocks crop out above the ground, as in New England, evidence of this kind may not mean very much. There water is held in rock fractures. Drilling is strictly hit or miss. A hole put down 10 feet away from an abundant well may be completely dry.

Next consult the state or county water authorities. They will have records of wells, and often they can give you some idea of how deep you may have to go. Another source of information is the Ground Water Branch of the Geological Survey, U. S. Department of the Interior (Washington 25, D. C., or Denver Federal Center, Denver, Col.), which has field offices in 44 states.

Geologist Geraghty also offers some clues that may lead you to water, or at least narrow the odds:

- Try near streams, especially if they flow continuously the year around. This usually means that they are fed by ground water.
- Broad, flat areas between hills tend to have water-holding sand and gravel beds.
- Springs are a positive indication of water, and swamps are actually exposed areas of the ground-water table.
- In arid regions, such as the Southwest, certain "phreatophyte" grasses and shrubs, and such trees as birch, willow, cottonwood and sycamore are a sign that water is not far down. The local agricultural agent will know.
- Coastal areas may be good bets even if there are reports of salty wells in the neighborhood. This needn't be a thumbs-down sign. In many cases fresh water can be found either above or below the salt-water deposits.

The man who is going to drill your well

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will have something to say about where he breaks ground to tap for water. He knows the local picture, and the last thing a reputable driller wants is to put down a dry hole. Justly or unjustly, he gets the blame. If possible, it is a good idea to interview several drillers, preferably at the site. Let them know that you are shopping around.

When you pick your man, have a clear understanding with him on your water needs. The less water you require, the better your chances of coming in at a moderate depth. Well drillers are as honest as other men, but since they usually charge by the foot, they are subject to the temptation to drill to greater footage than you may actually need. As a matter of fact, you don't necessarily get more water at greater depths—sometimes you get less.

How much water? A minimum of 50 gallons a day should be allowed for each member of the family. But since modern kitchen and laundry appliances use a lot of water, 100 gallons is more like it. The well should yield in two hours of pumping all the water that will be required in 24 hours. For a family of four that means 200 gallons an hour, or three to four gallons a minute.

The smallest pumps on the market will move about 250 gallons an hour. This yield is available in most parts of the United States, and in many sections larger yields are the rule rather than the exception. If you have big areas of lawn to sprinkle, a garden to water, or are planning a swimming pool, you'd better increase the requirements.

Fire underwriters also must be considered. They demand a certain minimum yield. If you don't have it, your insurance rates may skyrocket. The requirements vary throughout the country. Better check.

Buying an old house with an existing well doesn't necessarily mean that your water problem is solved. The quality of the water system is one of the hidden factors in house evaluation.

Check on the date of the last bad drought and spring a surprise question on the owner: "Did you run out of water at such and such a time?" Pinned down, he may hedge: "Er . . . all the wells hereabouts were low that summer and we had to be kind of careful for a week or so." He may be telling the truth, but it's safer, if somewhat cynical, to assume that he ran completely dry.

Asking the neighbors is in the books too, although you may not get the whole truth where the sale of a house is involved. They don't want to hurt a friend's chances of selling, or they may be short of water themselves and also want to sell. As a rule, water scarcity is as carefully concealed as certain diseases. But some people are frank, so it's worth trying.

Check the water sources mentioned before. Then do some on-the-spot investigating. Dug wells, although they may have supplied water for generations, often give out in dry seasons, so be wary. But since they are in the open, you can easily check. If there is four feet or more during a drought, you're in good shape.

Drought time is well-evaluating time. If the place you are looking at has a sizable lawn or garden and everything is green after a couple of months without rain, it's evidence that the owner has water to spare for sprinkling.

Driven and drilled wells are not so easy to check. There is a simple do-it-yourself test. Open two faucets all the way. (In a two-story house one should be upstairs.) The pump will start. If, after 30 minutes of pumping, both faucets are still putting out a full stream of clear water, the system is okay under existing conditions. A thin stream from the upper faucet, well along in the test, isn't too bad so long as the lower faucet still supplies a full stream. But if the system starts pumping air, you'll get *no* flow at the faucets. If it starts spitting sand, you'll get a mixture that, as one wit put it, is too thin to plow but too thick to drink.

If you're still in doubt, most drillers will make pumping tests at the well. If the owner won't let you check up on his system, it's best not to buy, no matter how much your wife loves the kitchen. She won't love it so much if she has to wait an hour to get enough water to do the dishes.

Moral: Don't ever take your water supply for granted—"You never miss it till the well runs dry." Today our national consumption is more than 200 billion gallons a day. Department of Interior experts estimate that in 20 years we will need almost 500 billion gallons of water a day to satisfy our needs. It's something to think about—and plan for. END

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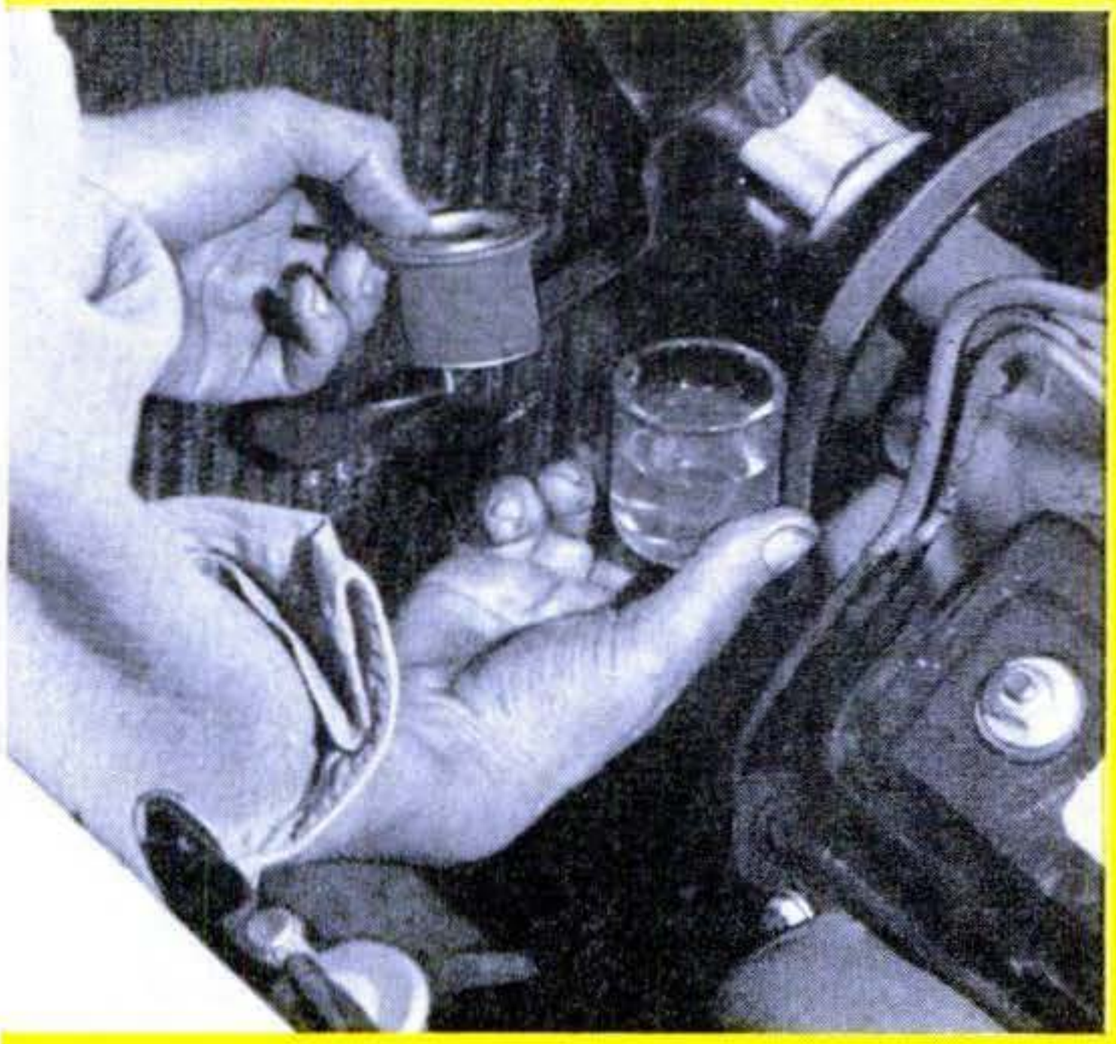
4 Saturday Car Jobs You Can Do

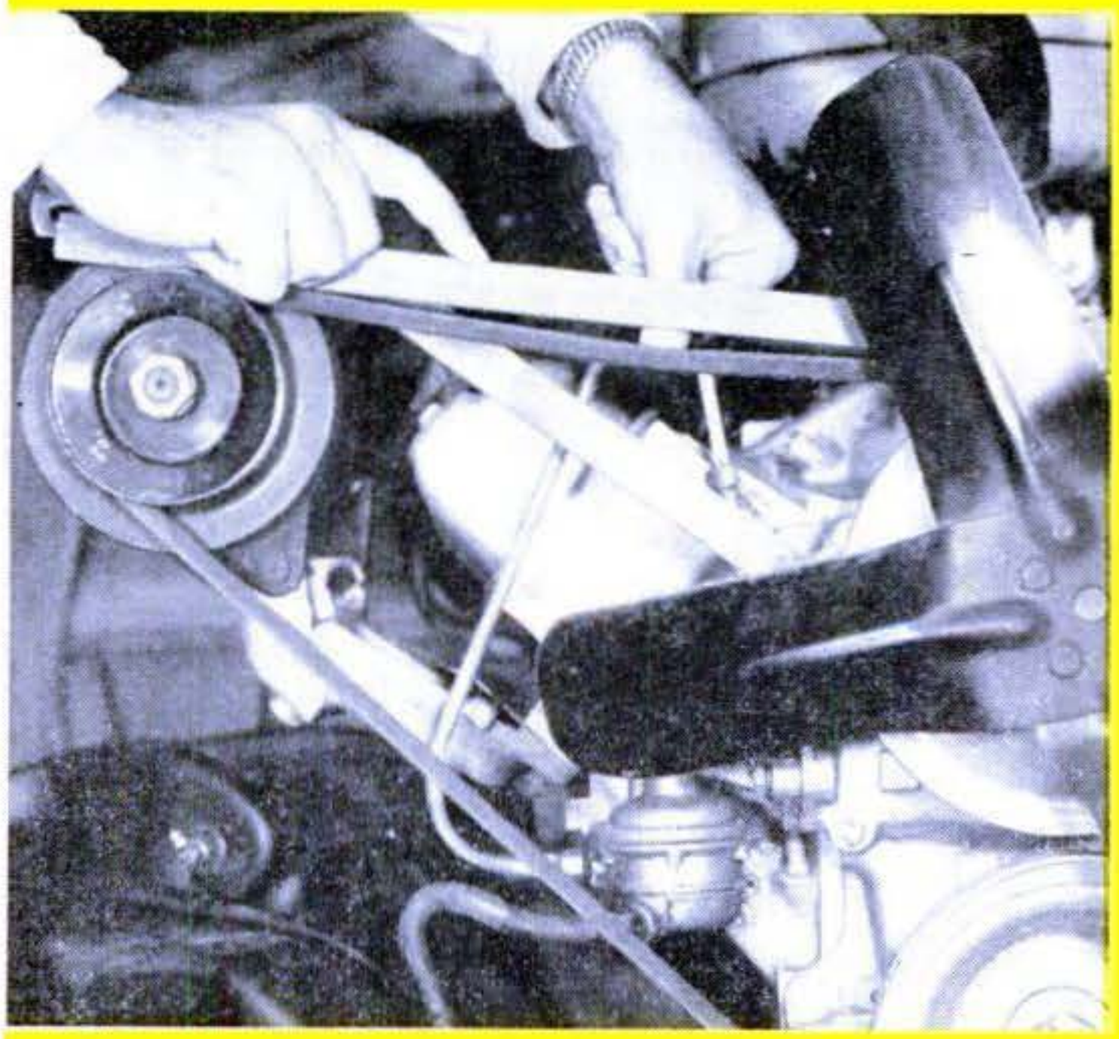
Auto Upkeep

By Phil McCafferty and Herbert R. Pfister

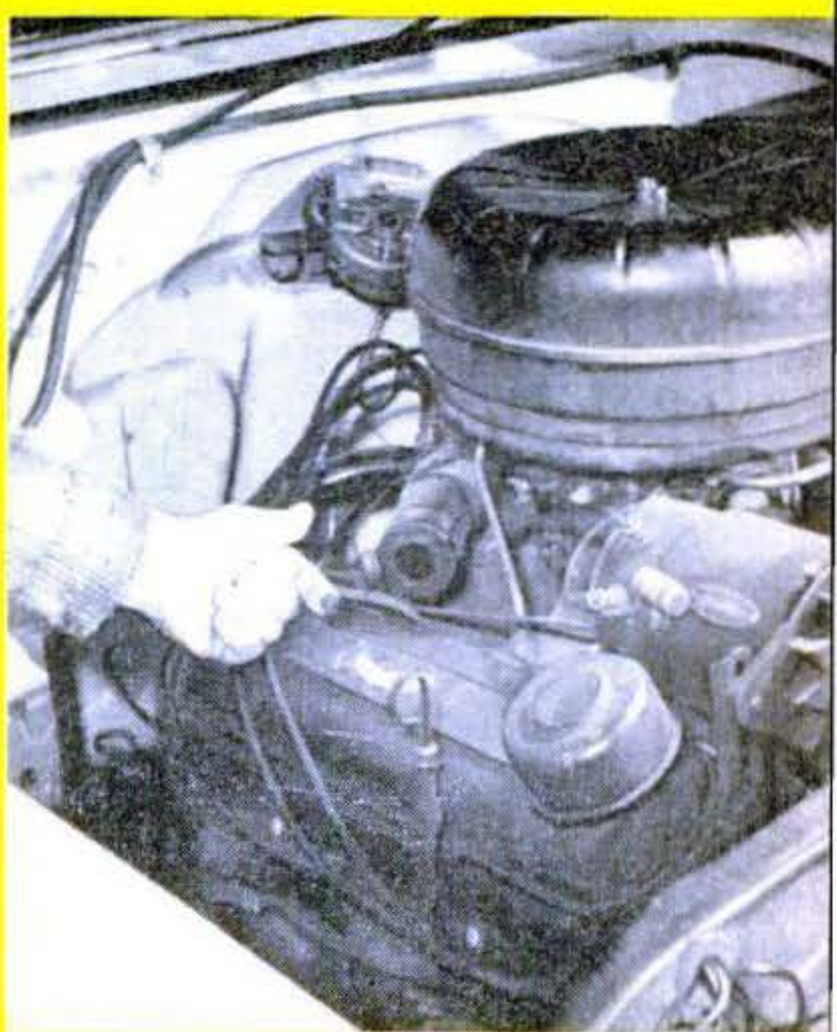


Clean the Fuel Filter

Get Acquainted with the Fuses



Check Up on the Fan Belt



Wash the Engine

These easy back-yard jobs may save you trouble on the highway. For details, see the pages that follow

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Clean the Fuel Filter

IF YOU'RE an average driver, you'll likely run some four or five hundred gallons of gas through your car's fuel system in a year's time.

You wouldn't think of smoking your favorite pipe very long without a cleaning, yet the deposits you find in a pipe stem are mild indeed compared to the stuff you can find collected, clogging and even passing through a long-neglected gas-line filter: such undesirable stuff as water, sediment, rust, lint, and (this is a fact) strained grasshoppers. If the filter is clogged, little or no fuel passes. If the filter passes everything, your fuel pump and that complex up-to-$100 four-barrel carburetor are the stakes.

FILTER BOWL can be found hanging on the gas line or built onto the fuel pump. On some cars it's hidden from view.

WATER AND SEDIMENT, heavier than gasoline, sink to the bottom of the bowl (left photo). Clean it thoroughly.

Clean every 4,000 miles to avoid possible fuel-system ills. Just loosen the bulb thumbscrew, remove the bulb and dump the gasoline. If your car is an older model you may find only a very fine brass screen between the bulb flange and the die-cast filter body. Check the screen condition. If it is deformed or badly clogged, replace it. If it looks good, blow it off, clean the bowl and put it back.

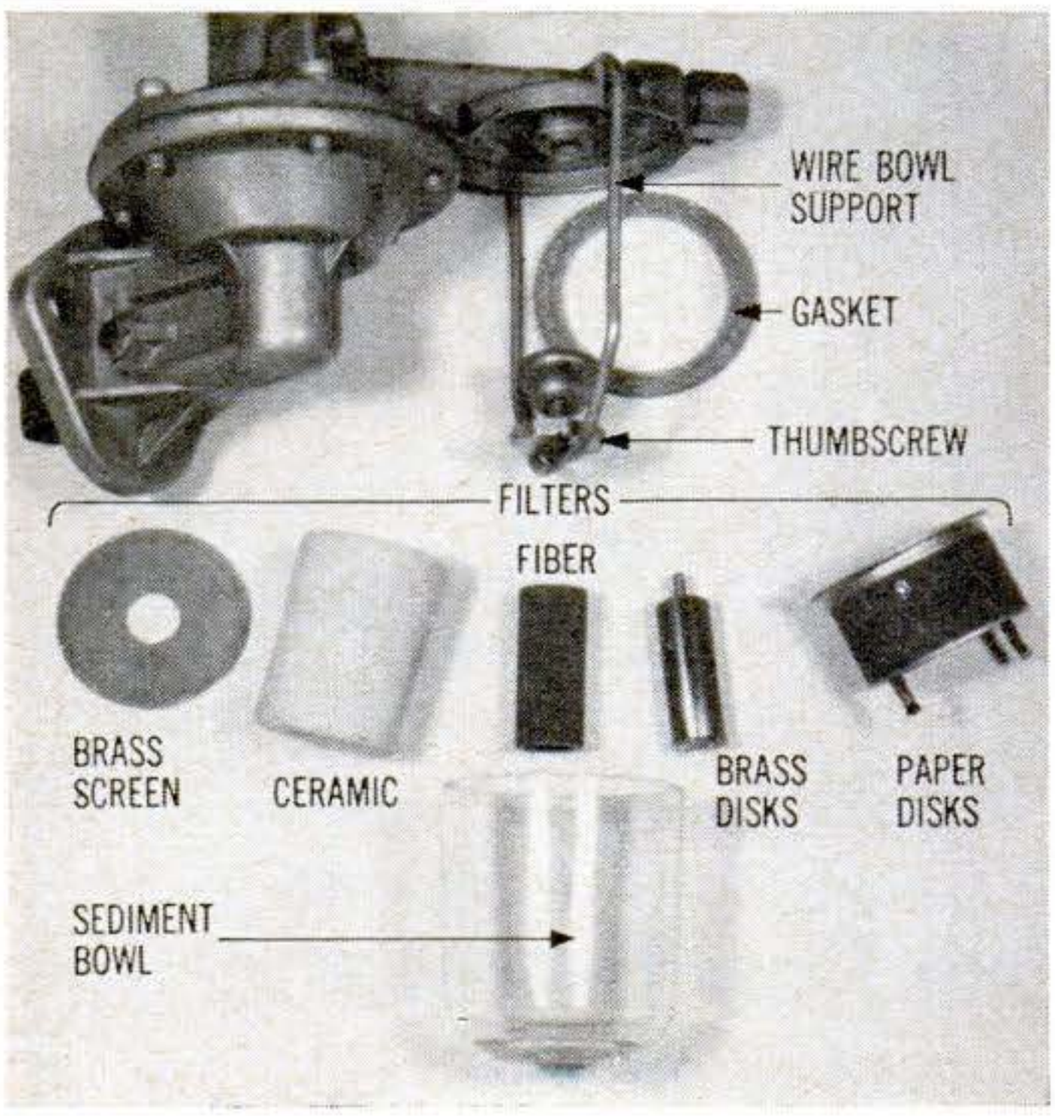
On newer cars the filtering elements run the gamut from porous ceramic cylinders through layers of paperlike disks to stacks of specially formed bronze washers. All can be cleaned by blowing with compressed air, need to be replaced only if visibly damaged or hopelessly plugged. One exception: The paper-disk-type element should be replaced with a new one if water is found in the sediment bulb. Water makes these elements swell and partially restrict fuel flow.

The synthetic rubber gaskets on many fuel filters will stand many removals, but cork gaskets will likely leak if not replaced when the filter is removed for cleaning. Seat the bowl carefully on the gasket when you put it back in place.

Trouble checkpoint. The fuel filter is a good place to check if your car won't run and fuel trouble is suspected. If the bulb is empty or nearly so, check for a plugged gas line, loose connection or plugged gas-tank vent.

If the filter is full, it's a pretty safe bet your troubles lie in the fuel pump, carburetor or connecting line.

Don't jump the gun if the bulb on your new car is only two-thirds full. Some late-model cars are engineered to operate that way.



A TYPICAL FILTER is removed by loosening the thumbscrew beneath the bowl and swinging the wire support to one side. In the bowl you may find one of several cartridge-type filters or only the simple brass screen shown at the left.

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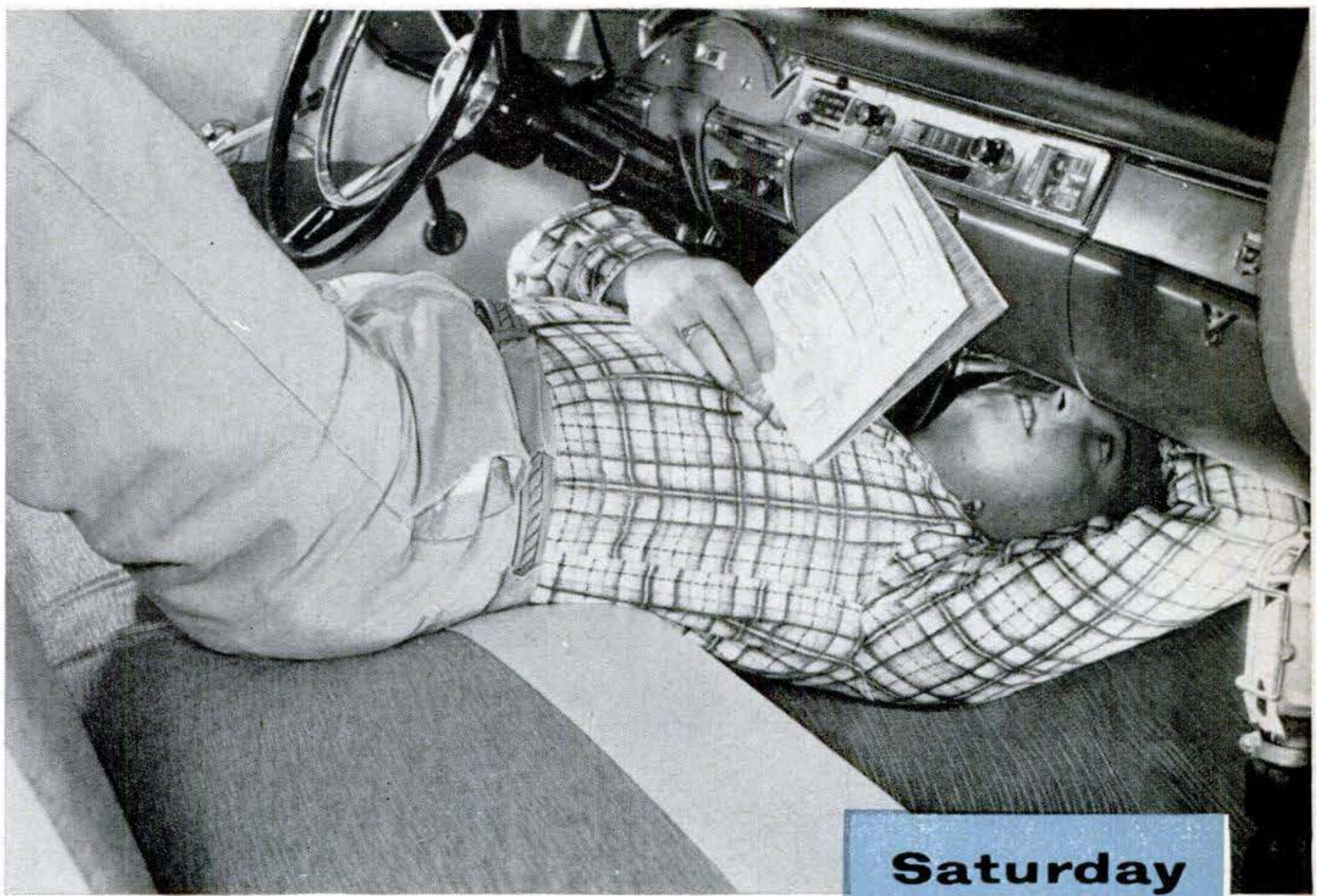

LOOK AT 'EM IN DAYLIGHT so you'll know where they are if they fail at night. The owner's manual will help you spot scattered locations.

Saturday Car Jobs

Get Acquainted with the Fuses

YOU have a scant handful of tiny fuses and circuit breakers protecting your car's electrical system. They stand guard ready to prevent expensive damage when amperage gets too high. These tiny metal strips can prevent battery drain, fire and damaged parts—heaters, clocks, radios, lights; practically every piece of electrical gear in your car.

Learn by exploring. You might well spend a bright Saturday morning learning about your fuses and breakers. Check the sizes and locations in your owner's manual, then find them. Knowing where to look can save you plenty of inconvenience in replacing a blown fuse or bad breaker in the dark.

On some cars, you'll find all the protective devices mounted on a neatly labeled panel in the engine compartment. But on most makes you'll probably find fuses hidden in little holders on the wires under the dash and sometimes even under the seat. The circuit breakers? It's a fair bet you'll find one or two sealed inside the headlight switch, but don't tamper with them if lights are okay.

Not a cause of trouble. Normally fuses don't blow and circuit breakers don't open without good reason. They act before excessively high current can melt a motor's windings, ruin an overdrive solenoid or hopelessly burn wiring.

A fuse is simply a glass-covered thin strip of soft alloy designed to melt when subjected to the heat produced by current flow in excess of the fuse's rated amperage. It is wired in series between the battery and accessory.

A circuit breaker is a pair of contact points. One is stationary. The other is attached to a bimetallic strip that pulls it

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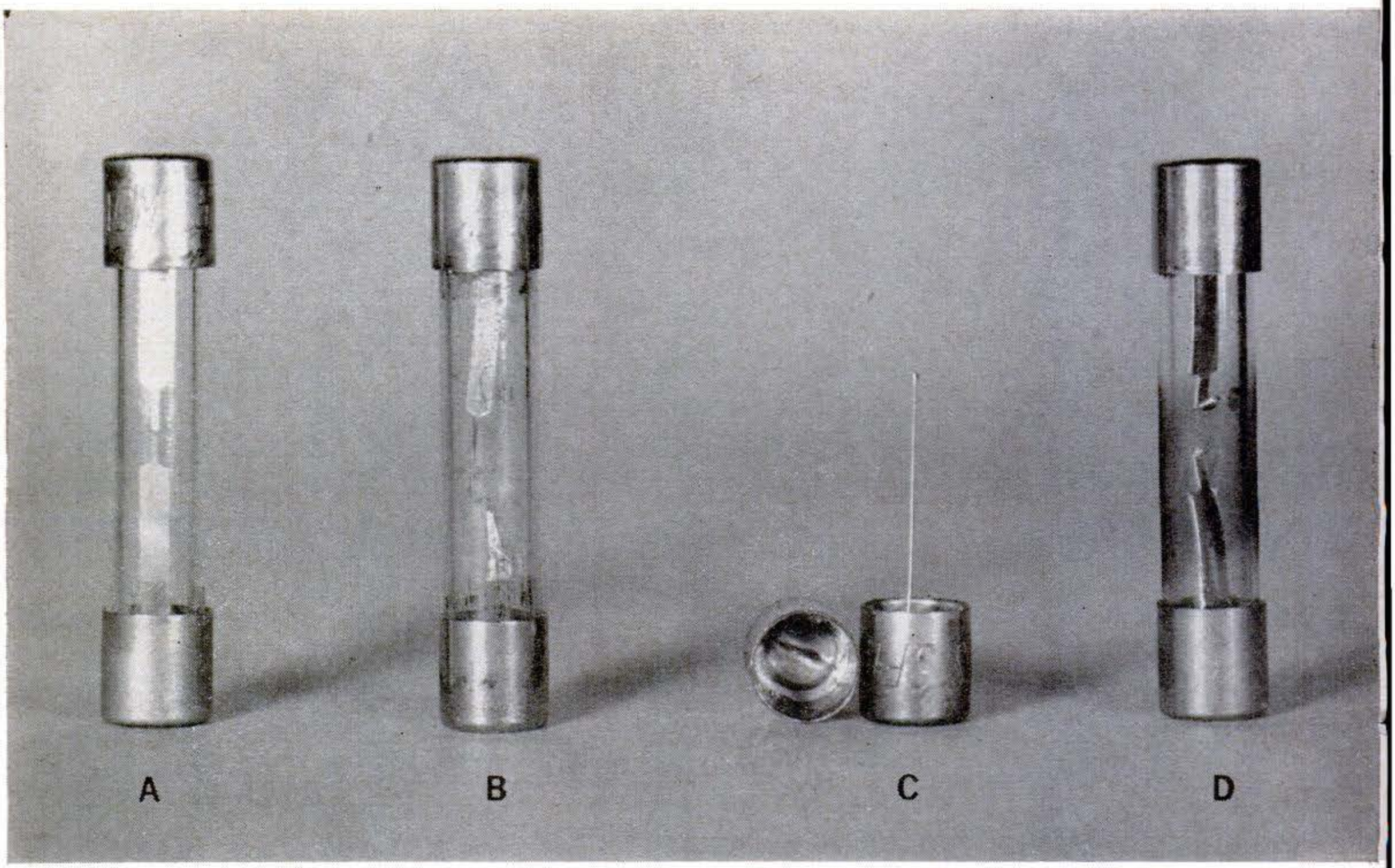

FUSES CAN BE TRICKY: Sometimes they just *look* blown. Fuse A didn't blow at all; it broke from age, heat and vibration. Fuse B was "teased" into looking blown by the intermittent high current that comes with a bad ground in the circuit. Fuse C is definitely blown, but the break in the fuse metal was hidden behind a metal end cap—a tough one to spot. Fuse D has been normally blown—melted apart at the thin section with the tube discolored by heat.

away from the fixed point when subjected to heat caused by more than its rated current load. Circuit breakers are used in the headlight circuit in place of fuses to keep the lights fluttering on and off instead of cutting them out completely in case of a short. At 65 m.p.h. on a dark highway, flickering headlights are better than none.

Checking the fuse is the first order of business when you're aware an accessory is on the fritz. Close examination of the fuse will tell you plenty. A tiny hairline crack across the fuse strip usually means it is simply broken—perhaps from normal heat, age and vibration. A new fuse will fix the trouble. This type of ailment is not so easy to find when the crack occurs inside the fuse cap. If an unseen break is suspected, trying a new fuse is the simplest way to check.

A fuse that is discolored, with a badly twisted and slightly melted strip, is probably one that has been "teased" into failure by the intermittently high current that comes with a bad circuit ground. Check the accessory grounding.

A blown fuse can be spotted by the widely separated and melted strip, and discoloration around the break. Check obvious troubles like poor grounds and bare wires. Then try a new fuse.

These common troubles are what mechanics find—in the majority of cases—when a blown fuse gives the signal:

- Blower motors of heaters usually blow fuses because of a shorted armature or field winding. The armature's labored attempt and failure to rotate when the motor is hooked directly to the battery will likely verify this.
- Turn-signal fuse blowing is not normally caused by a bad flasher unit, but by shorted wiring. Remember, the whole stop-light and tail-light system may be hooked into this circuit.
- Overdrive. Solenoids are the usual trouble spot here. Water coming into the drain plug on the bottom of this unit can cause the solenoid windings to short out.
- Radio. It's 10 to one that a blown fuse means stuck vibrator points. There's a 50-50 chance a new vibrator will rem-

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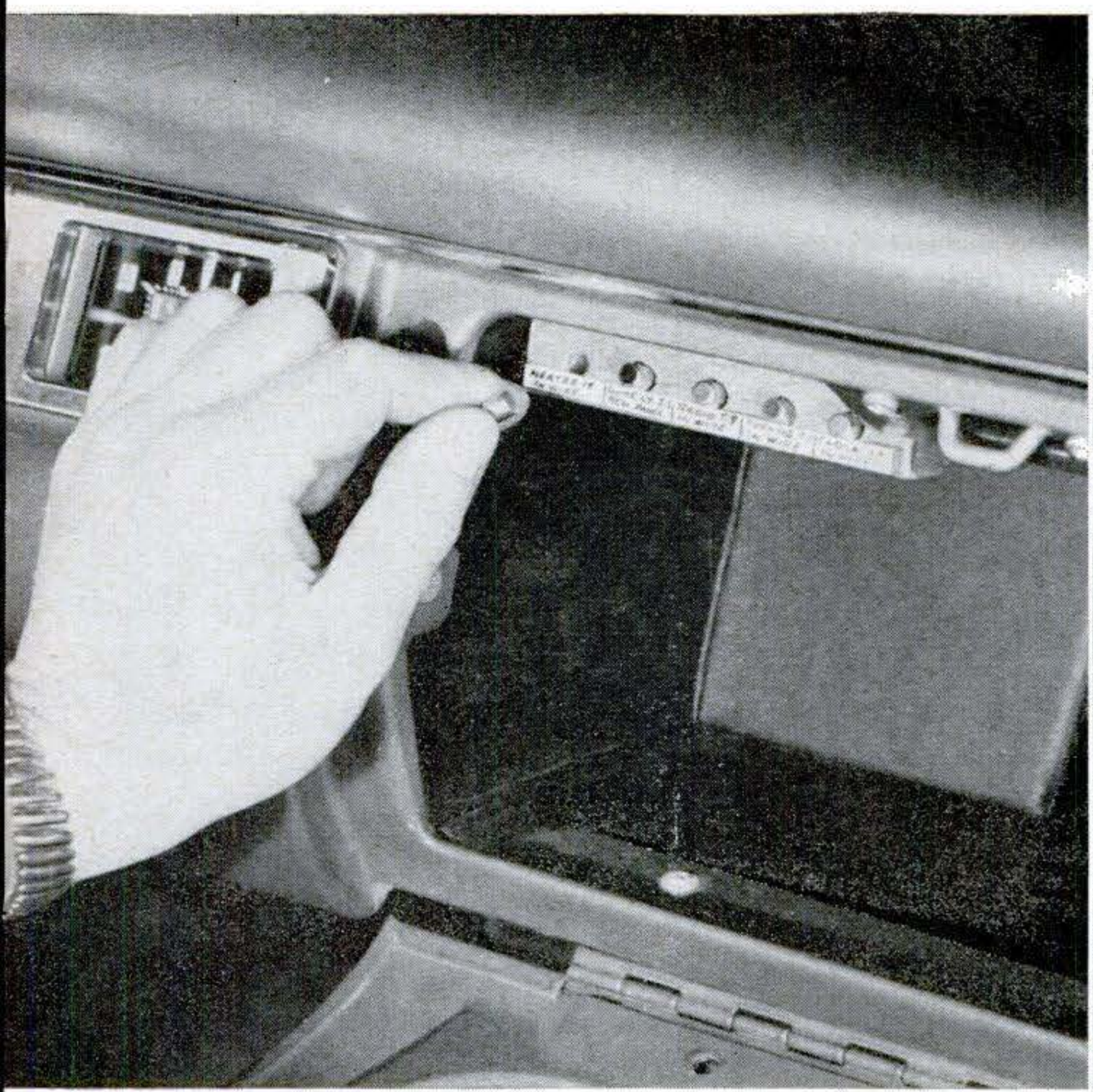

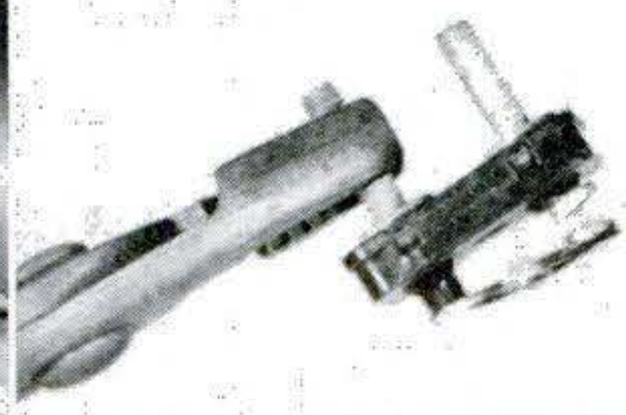

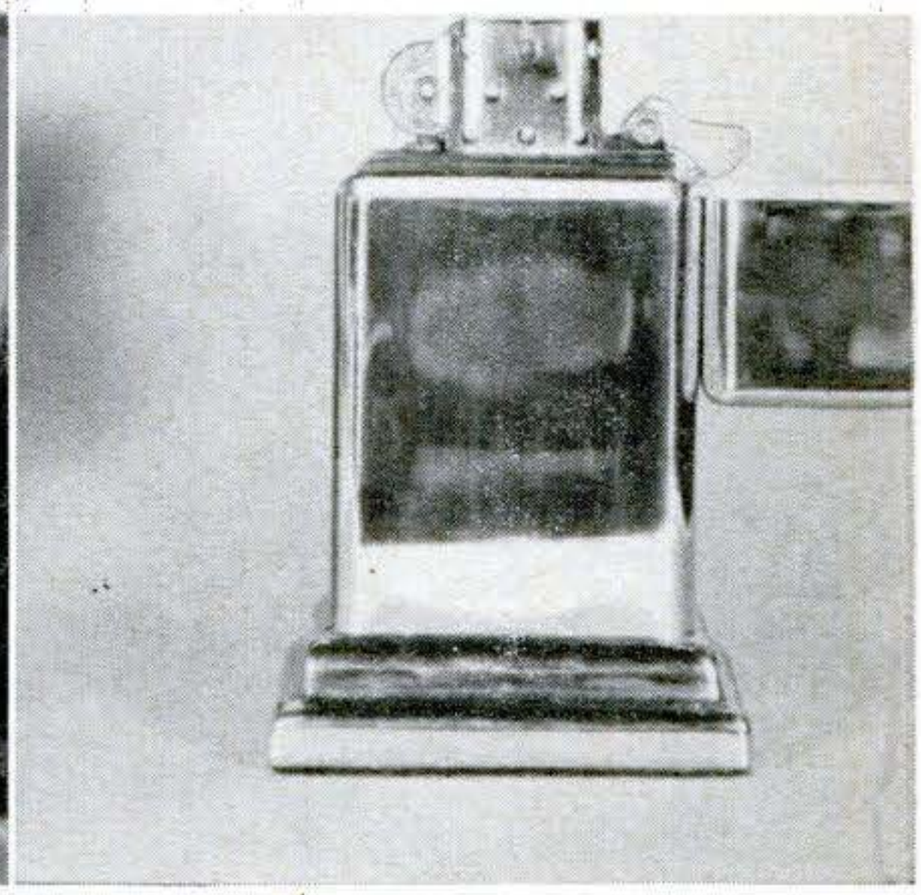

A FUSE FOR EACH CIRCUIT can be kept handy in a wood-block holder cemented or screwed to the top edge of the glove compartment. Holes drilled at a slight angle and to a depth needed to expose the fuse end-caps provide snug storage.

CIRCUIT BREAKERS are best left alone unless headlights begin to flicker, indicating a short in the headlight circuit. Contact points separate momentarily when heat (induced by lighter above) causes the bi-metal strip to expand.

edy the trouble, a one-in-50 chance that removing the vibrator and giving it a sharp rap will free the stuck points. But the usual chain of events is this: The radio buffer capacitor shorts intermittently or entirely, overloading the vibrator. This makes the points burn and stick. If that is the case, both capacitor and vibrator should be replaced.

- Dome- and interior-light troubles are hard to track down because the wiring and switches—the usual offenders—are hidden. Fortunately they don't often give trouble.
- Headlights, in most newer cars at least, are protected by one or two circuit breakers, seldom give trouble if wiring is in good shape. Breakers usually "click" when they open with much the same sound as a turn-signal flasher. If a breaker becomes fatigued to the point of failure because of repeated operation from a circuit short, it should be replaced. When breakers are integral with the headlight switch, the entire unit must usually be replaced.

Replacements are safest. When a fuse blows and a replacement is not available it is a time-honored trick to wrap the fuse with cigarette-package foil to "make" the cap. This *can't* blow—which really causes trouble. One idiot on a hunting trip found that a .22-caliber live cartridge just fit a fuse holder along the wiring. The cartridge blew—right in the hand of the unsuspecting mechanic called upon to fix the fuse-blowing circuit. Mechanics do, however, sometimes "make" a blown fuse by replacing it with a piece of copper tubing; then, to isolate the trouble, they spot-check current with an ammeter.

Always use the proper size fuse or breaker for replacement, and make sure fuse caps are clean conductors. Fuses know no voltage. A 14-amp fuse is just that, whether your car has a six- or 12-volt system.

Originate a new circuit from the battery when you add an accessory. A new five-amp load wired with an existing 13-amp load just won't go with a 15-amp fuse.

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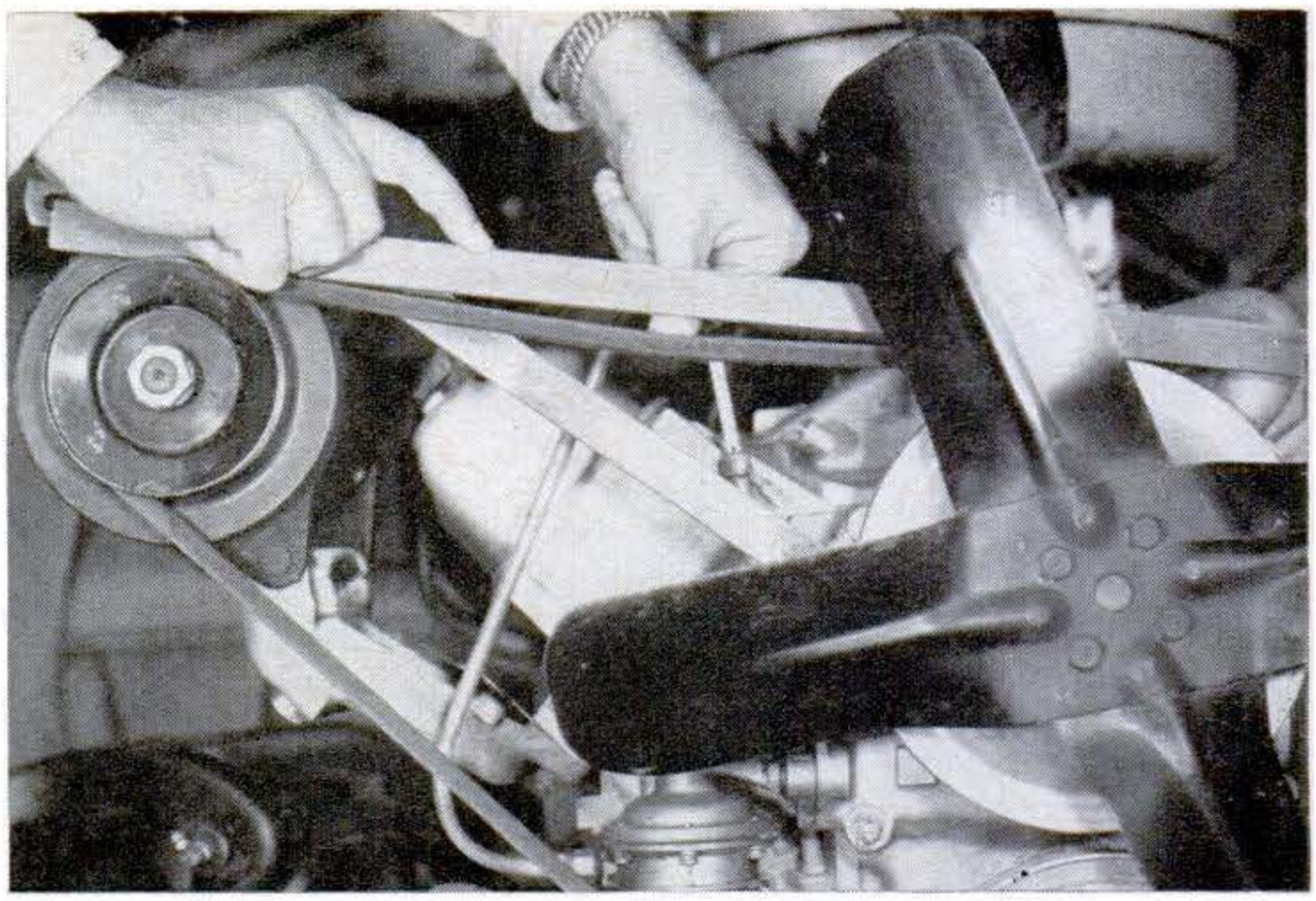


CHECK BELT TENSION every 5,000 miles or whenever you hear suspicious squeaks up front. Your car's instruction manual will tell you how much deflection the belt should have. Lay a stick across the pulleys and test deflection with thumb pressure at center of span.

Check Up on the Fan Belt

ON A trip from New York to Los Angeles your fan belt would travel about 30,000,000 feet—around and around under the hood. And while running for these 3,000-odd miles it drives a generator that develops enough power to run your TV set every evening for five weeks, a water pump that pumps enough water to provide a daily bath for a family of 13 kids for three months, and a fan that circulates more heated air than a political campaign. The belt and belt-driven equipment use from five percent to 15 percent of the horsepower your engine develops.

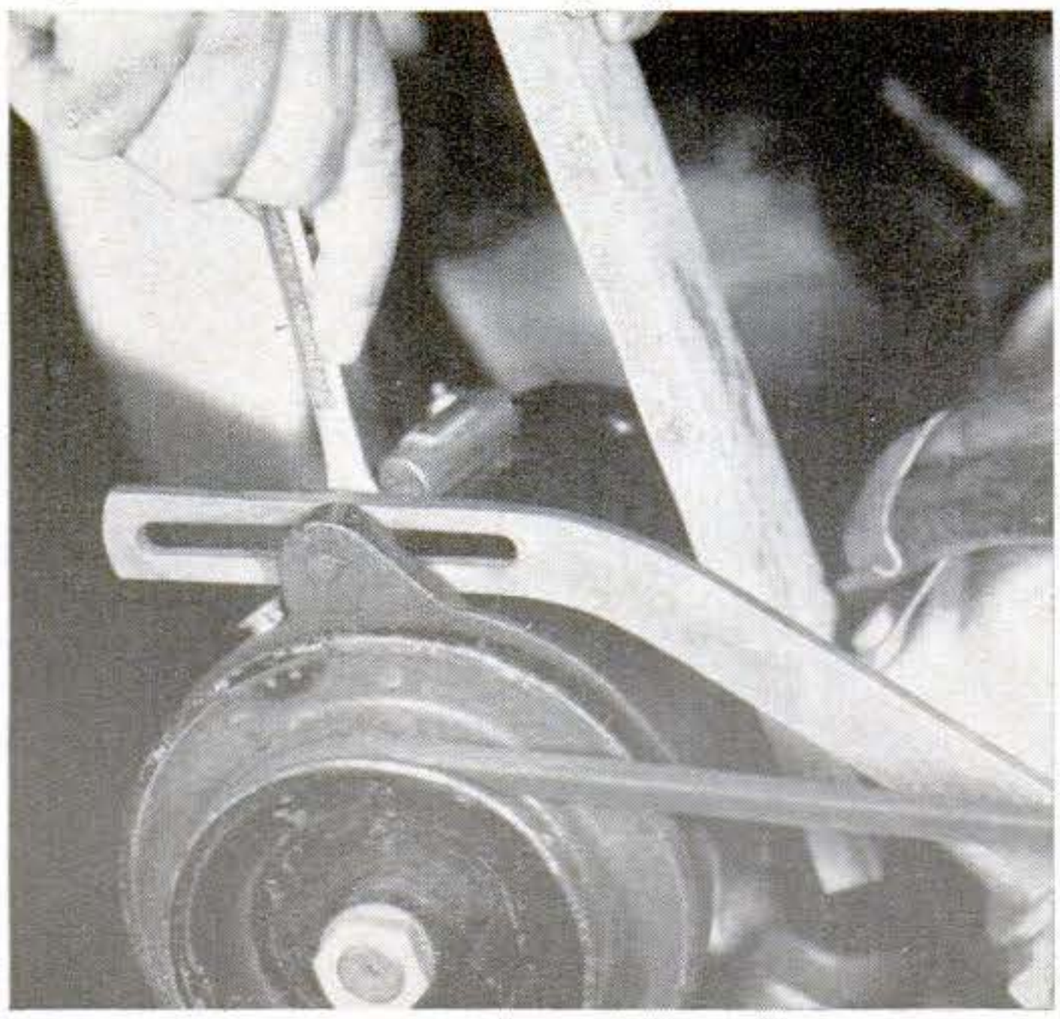
You may have more than one. It used to be one car, one belt. Not so anymore. Open the hood on a car and you may find little V belts sprouting like weeds after a spring rain . . . or the single belt being called upon to do more and more work—run air conditioners, power steering, power everything.

Sure, belts are better than ever. Gone are the flat belts of the Model T days, the fan chains of the early Caddies and the bigger V belts of recent years. These new slim belts are plenty tough and long lasting. You can get maximum service and reliability from them through proper care and by knowing what is wrong when trouble does develop.

Failing belts give warning. While driving, listen and look for these clues to belt trouble:

- A sudden high-pitched squeal under the hood upon acceleration usually means the belt is slipping on the pulley. Adjust it for proper tension. If the

ADJUST TENSION by loosening the generator's mounting bolts. Pry the generator outward with a scrap of wood and hold adjustment while you tighten the bolts. Recheck deflection before you consider the job done; sometimes things slip while bolts are being tightened.



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You need special spark plugs, too

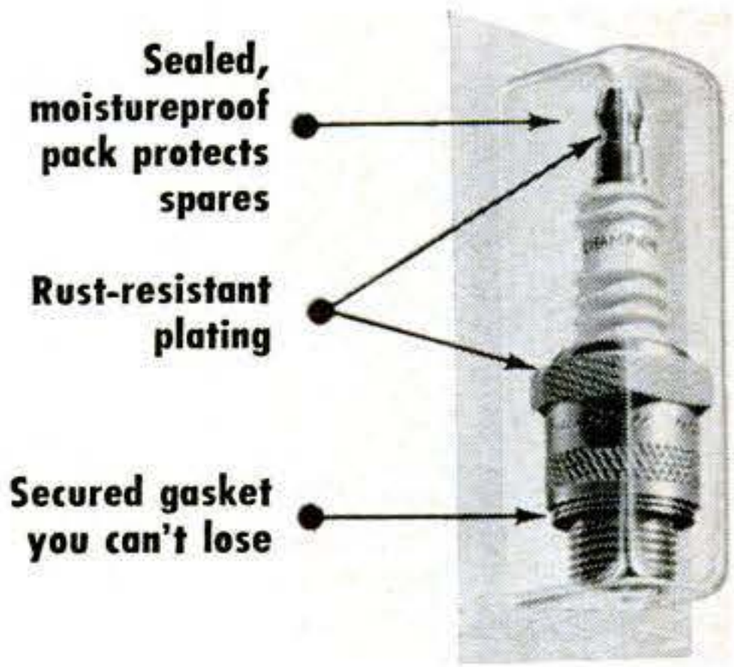
***Always use the spark plugs specially designed for outboards*— CHAMPIONS!**

With an outboard, you need special water skis—and special spark plugs.

For full power—you need a plug with a special electrode-gap design. Both regular and new plated outboard Champions have it. (Here's proof: In 1957, Champion-sparked craft won almost every major outboard race.)

These new plated Champion marine spark plugs protect against rust—have a secured gasket you can't lose. Sealed in individual moistureproof packs, these Champions stay clean and dry when carried as spares.

This season get full power from your outboard with new marine Champions—the spark plugs specially designed for outboard motors.



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EVERY MAJOR OUTBOARD MANUFACTURER APPROVES—AND USES CHAMPION SPARK PLUGS

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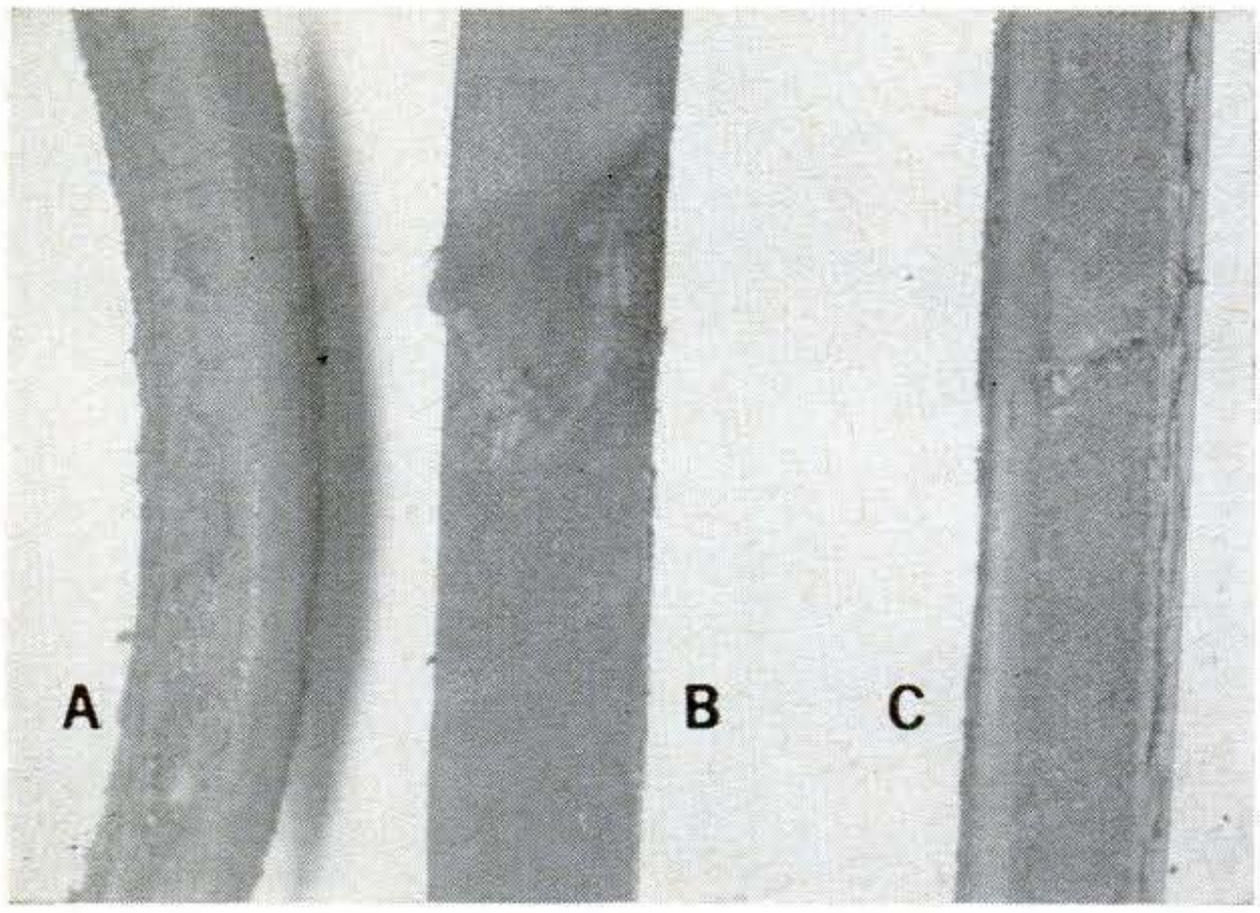
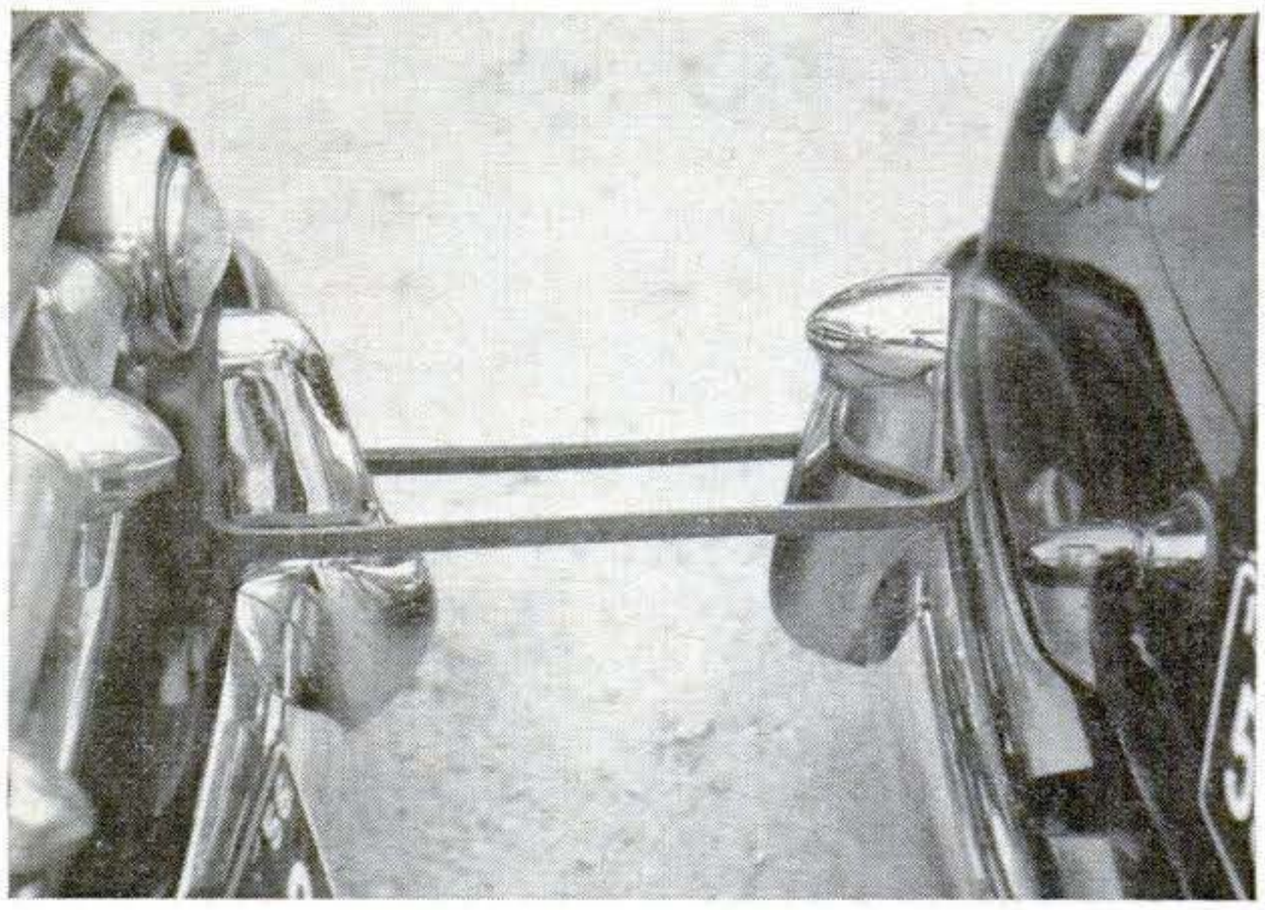
INSPECT THE BELT and replace it if you have any doubts about its condition. A new belt is cheap insurance. Three common belt ailments (below) are: (a) worn sides exposing the rubber core, (b) frayed or loose fabric covering and (c) cracks on the inside that cause thumping noises as they pass over the pulleys.





CARRY A SPARE fan belt in your trunk. They almost never break when you're driving past a service station where a replacement is handy, and in a pinch you can use it to tow a disabled car or be towed, as pictured above.

squeal occurs when you make a sharp turn in a car equipped with power steering, that's often a tip-off that the hydraulic-pump belt is loose. (Tight turns call for extra pump effort and the load on the belt is correspondingly greater.)

- A loud *ker-whop* under the hood, followed perhaps by a *slap-slap-slap,* means a broken belt.
- An annoying squeak in many cases is traced to a glazed belt. Some garages apply a bit of door and hood-latch grease to the inside corners of the belt, others scrape these same corners with a sharp screwdriver blade. The only permanent way to stop the annoyance, however, is to replace the offending belt.
- A tacky creak when the engine is idling may mean your belt is too tight. Check the tension. A tight belt shortens belt life and quickly damages water pump and generator bearings.
- A metronomic *tick-tick-tick* when idling could be caused by a piece of loose fabric on the belt slapping against the pulleys or engine components. Check the belt condition.
- A lit "gen" light, if your car has dash indicators, or no reading on the ammeter and/or a hot indication on the temperature gauge may mean a very loose or broken belt.

General care. Keep fan belts clean and dry for maximum service. If a belt wears repeatedly, one pulley on its circuit may be misaligned. All belts stretch, so when one belt on a dual-belted accessory needs a replacement, you'll be wise to change the pair.

Do all work on belts with the engine off. Jog the starter to expose a new section of belt or turn the fan blades by hand. One trip between a moving fan belt and pulley with a set of fingers may well have you dialing telephones the rest of your life with your thumb.

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Wash the Engine

Saturday Car Jobs

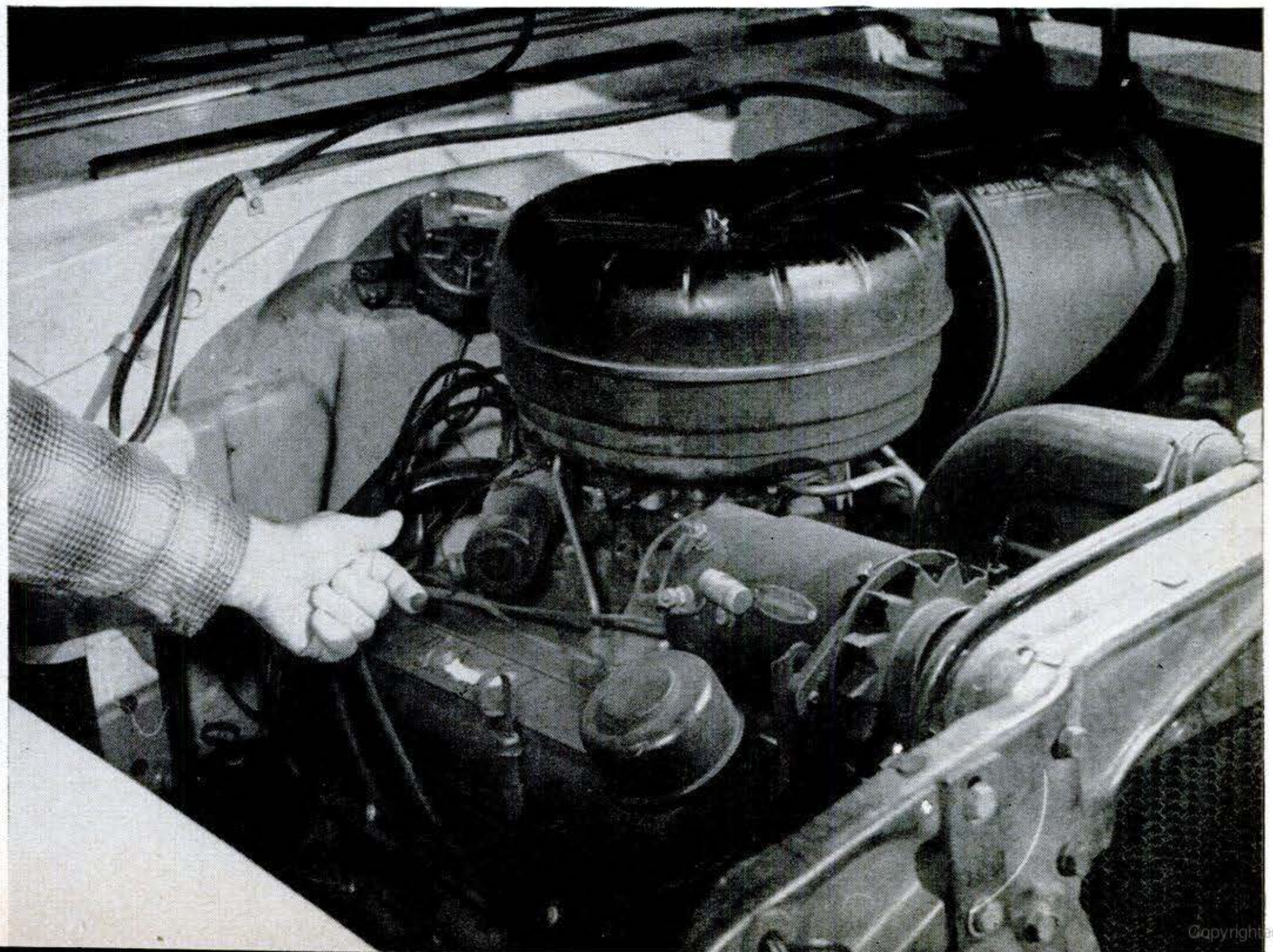
WHY should anyone want to clean an *engine?* The most obvious reason is appearance; a sparkling mill under the hood just plain looks nice, and you might get a few more bucks if you're thinking of selling. The practical reason is that the layer of oily dirt constantly building up on the block, valve covers and oil pan acts like a blanket of insulation that holds in engine heat. In cold weather, this will do no harm, but on some hot day in July it might make the difference between frequent boilovers and an enjoyable trip to the mountains.

The prospect of cleaning a grimy engine doesn't generate enthusiasm, even among the boys with the chrome-plated manifolds. But there are several products available in auto-supply stores (ask for degreasing solution) that you simply brush on to emulsify the mess, then flush off with hot water.

It's as easy as that.

ENGINE-CLEANING OUTFIT consists of degreasing solution, kerosene, an empty can, a toothbrush, old paintbrushes (stiff ones are best), a roll of self-adhering food wrap, tape, and a garden hose hooked up to a hot-water tap (hot water is a must; cold water won't do).

WHEN YOU CAN WRITE YOUR NAME in the grime on your engine, it's time to do something about it. The caked dirt on this engine was ½" thick along the front of the block, and the carburetor wore a blanket of dust stained red by gasoline. Looks aside, this situation risks overheating.



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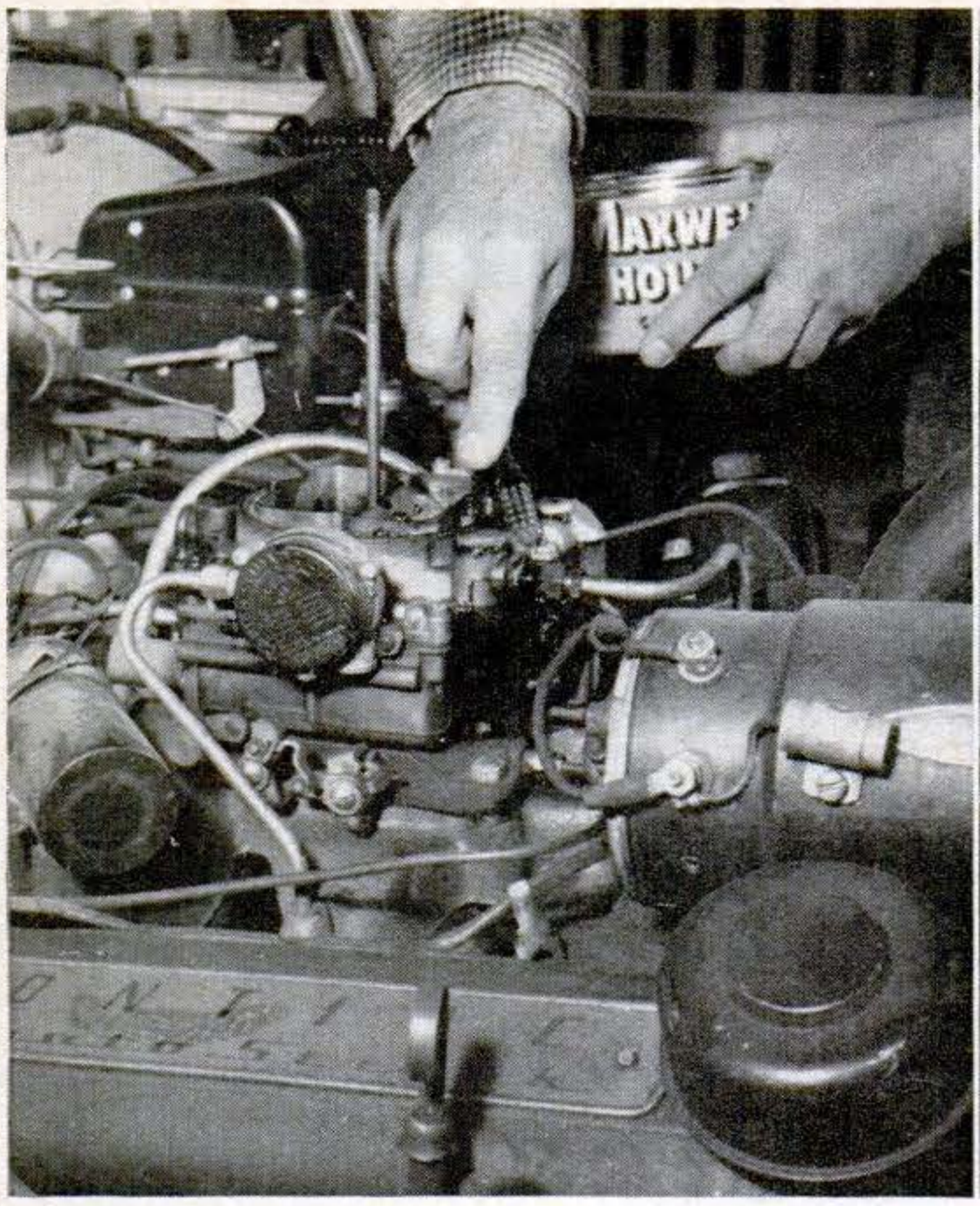
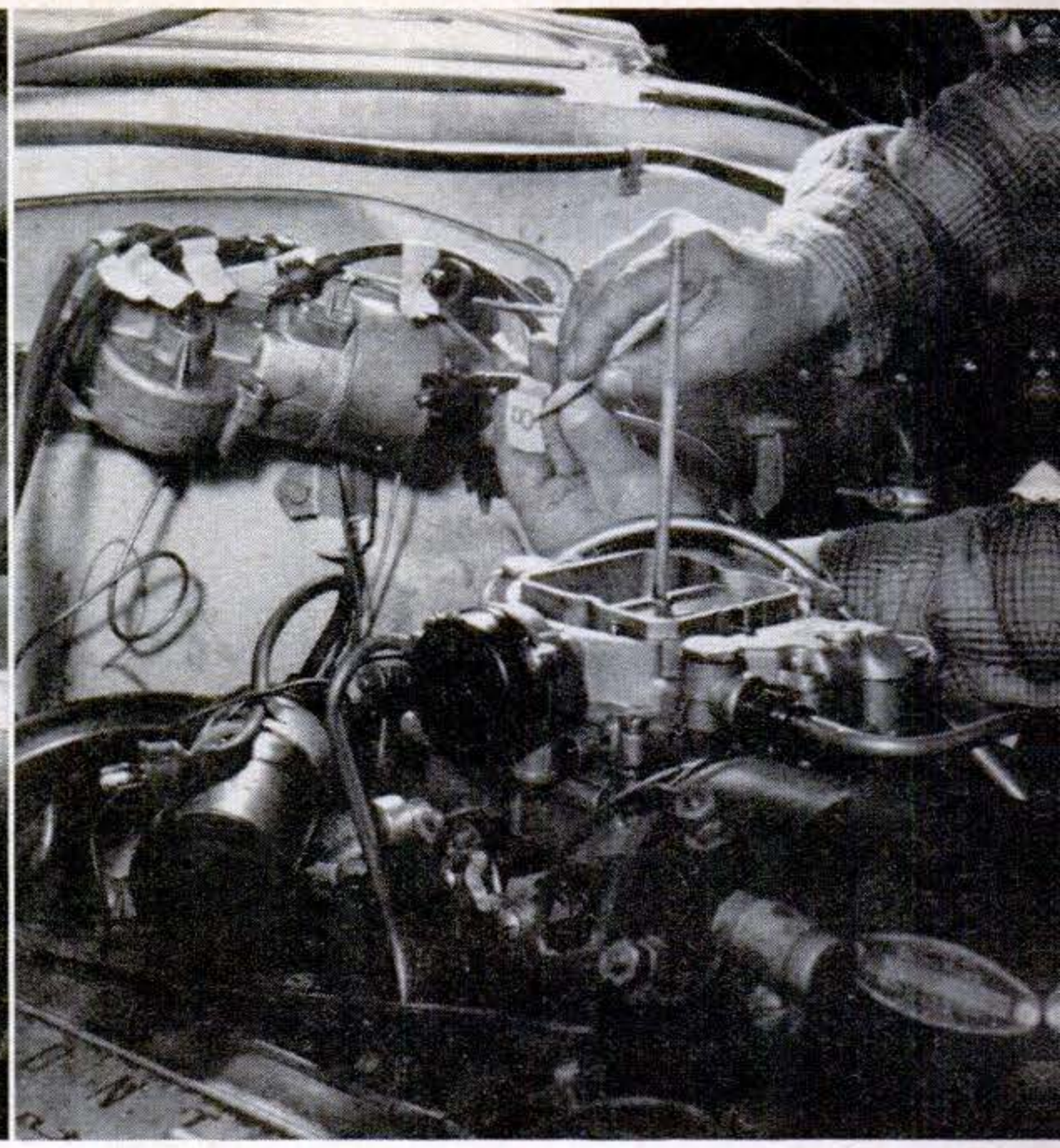
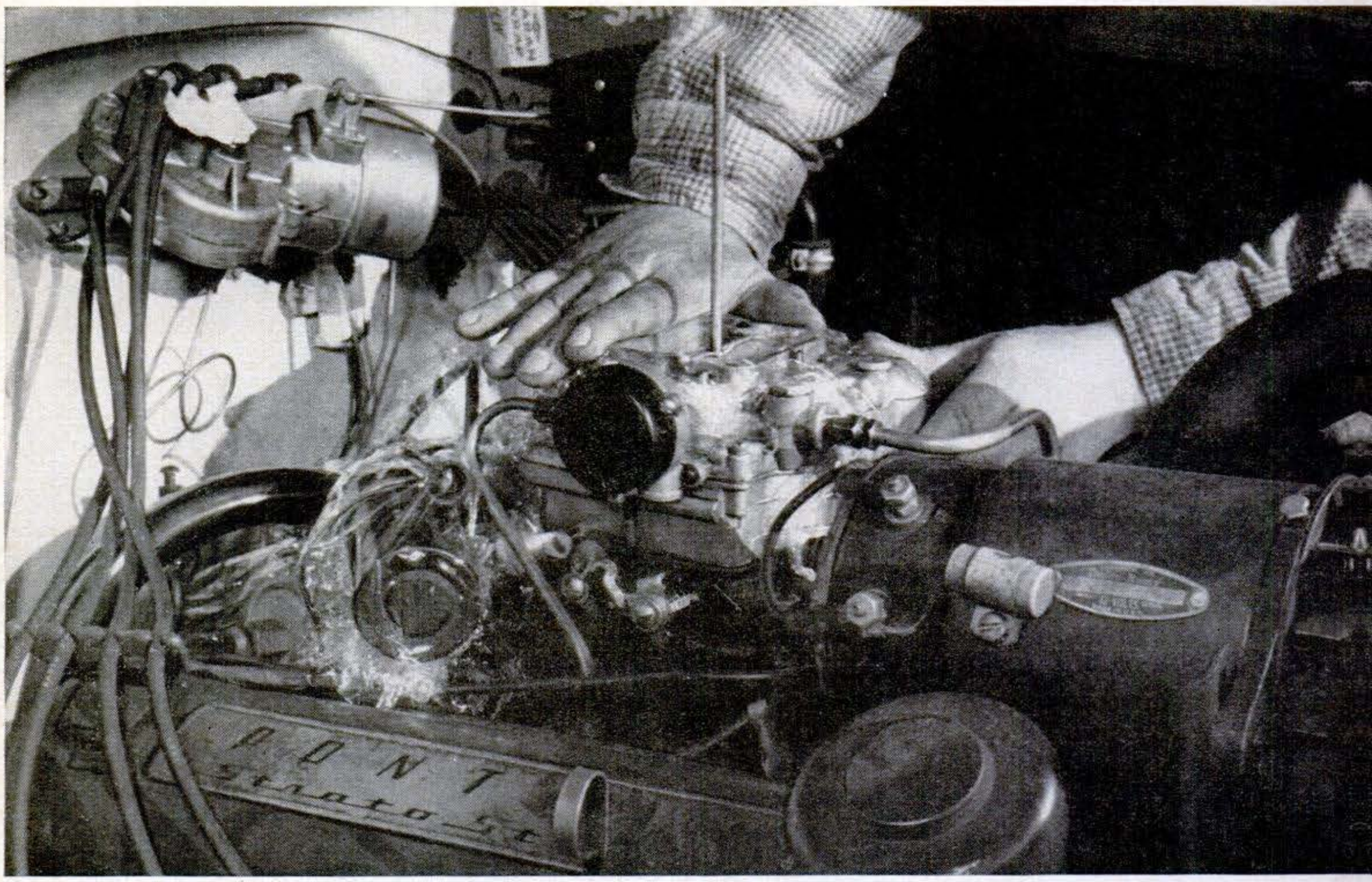


WORK FROM THE TOP of the engine. Remove the air cleaner and set it aside for washing later. Scrub the outside of the carburetor body, its throat, the choke butterfly and all linkage connections, using toothbrush and kerosene.



REMOVE THE IGNITION WIRES from the distributor cap and mark them with numbered tabs of tape. Mark the cap, too, or note which numbered wire is beside a spring clip, to be sure you put the wires back in their original positions.



WRAP THE CARBURETOR, coil and distributor with one of the self-adhering plastic products used to package foods for storage. Take care to seal the tops of the wrappings so water can't seep in when the engine is hosed down or you may have trouble later, trying to start.

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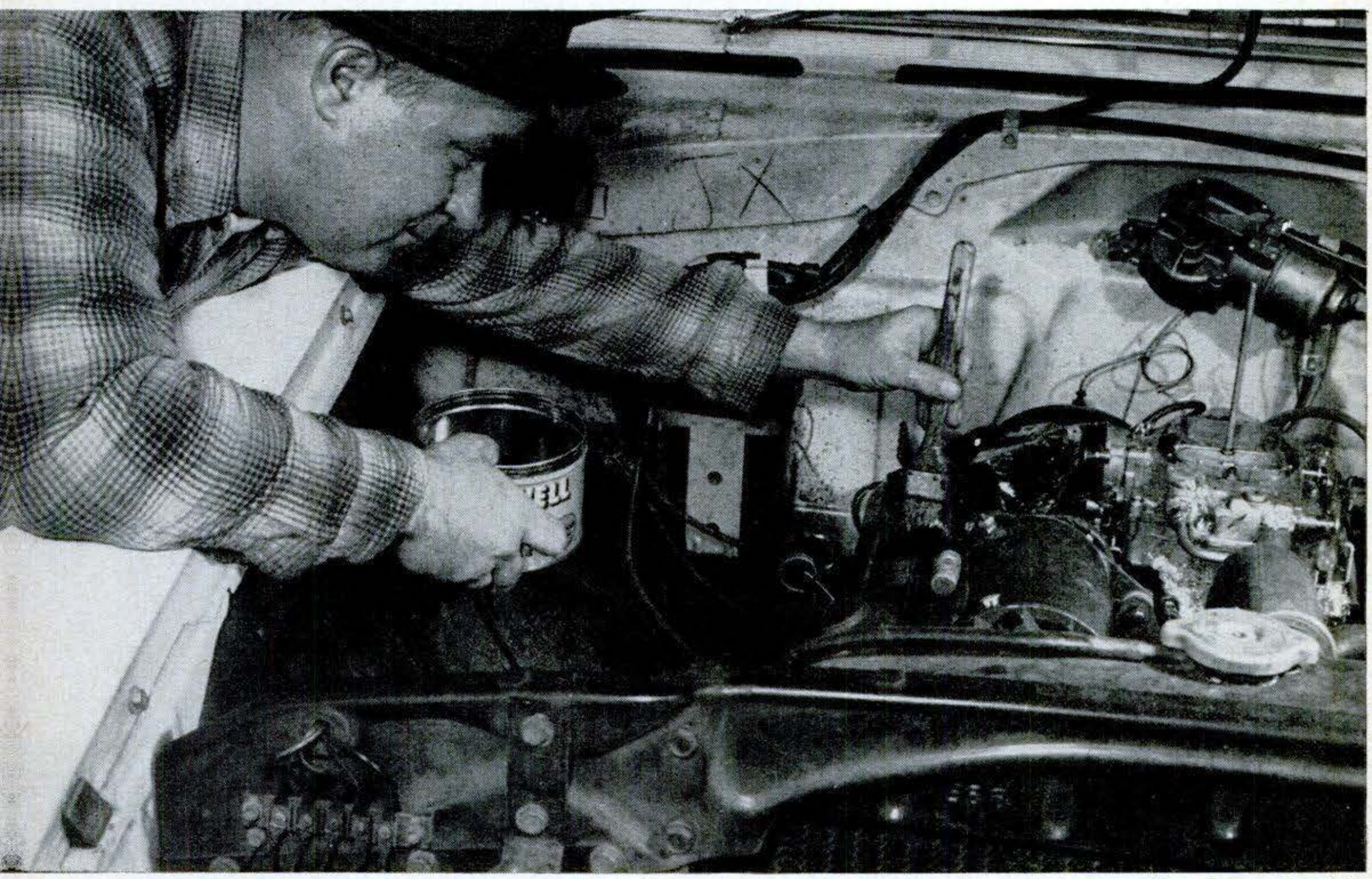
BRUSH DEGREASER over the distributor cap inside and out, working the brush between the terminals. Rinse the cap in hot water and dry it thoroughly with a cloth. Put the cap on the distributor, but don't connect the wires yet.



POUR DEGREASER into an empty can and brush it over engine, generator, fuel pump and radiator hose. Where dirt is thickly caked, loosen it with a stick. The engine may be cleaned while warm but not when hot enough to dry the solution on contact. *(Please turn the page)*

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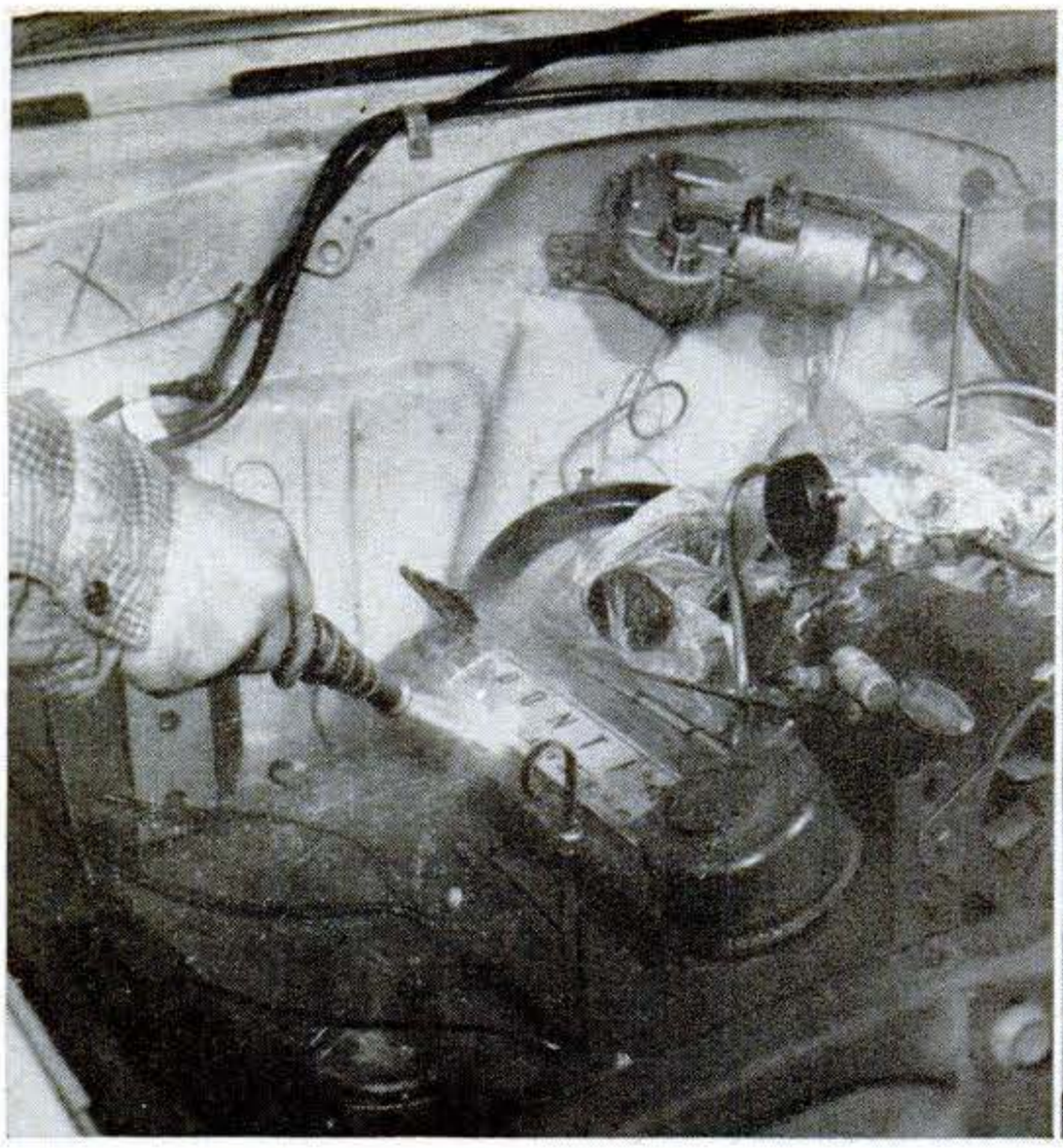
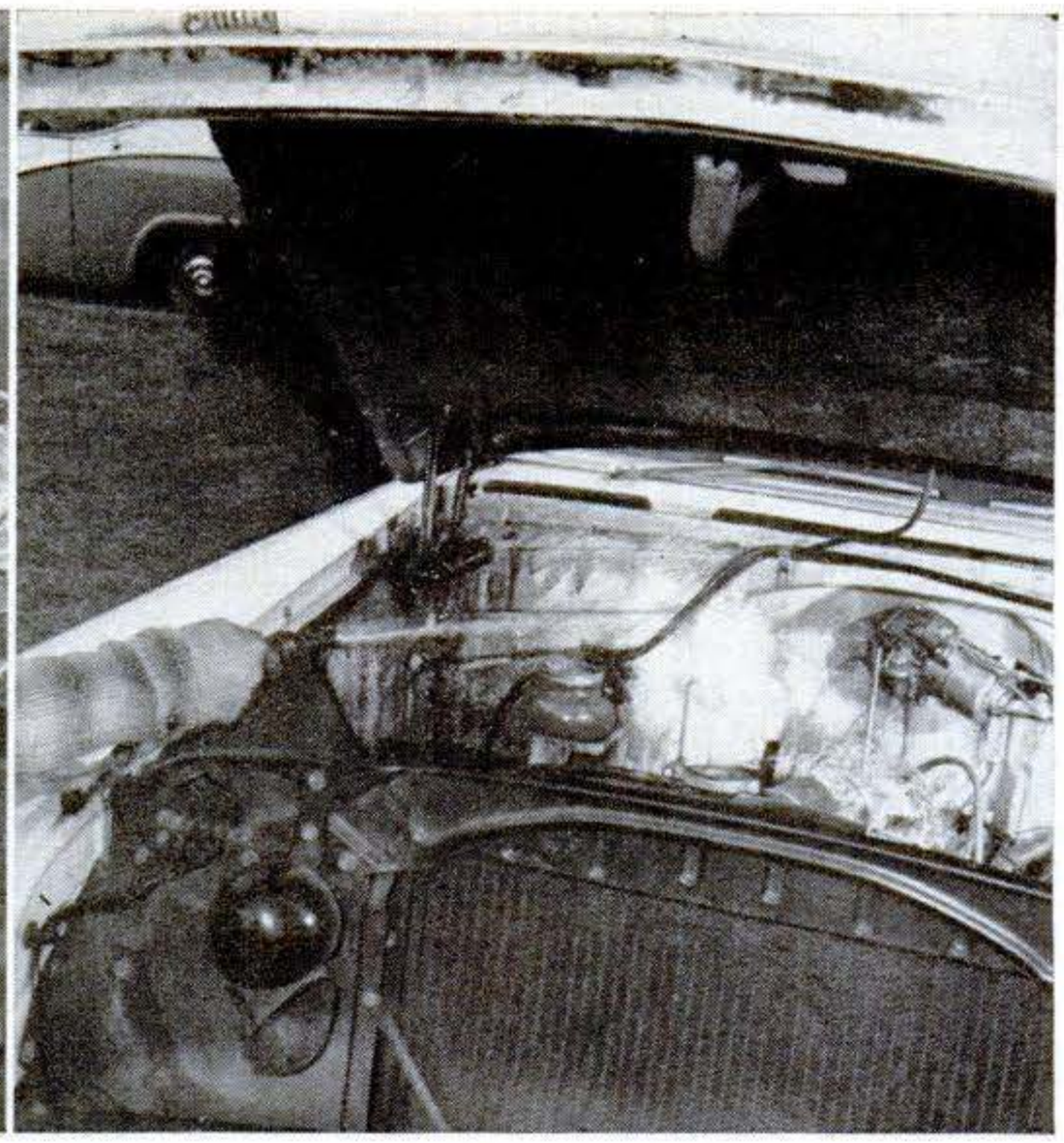
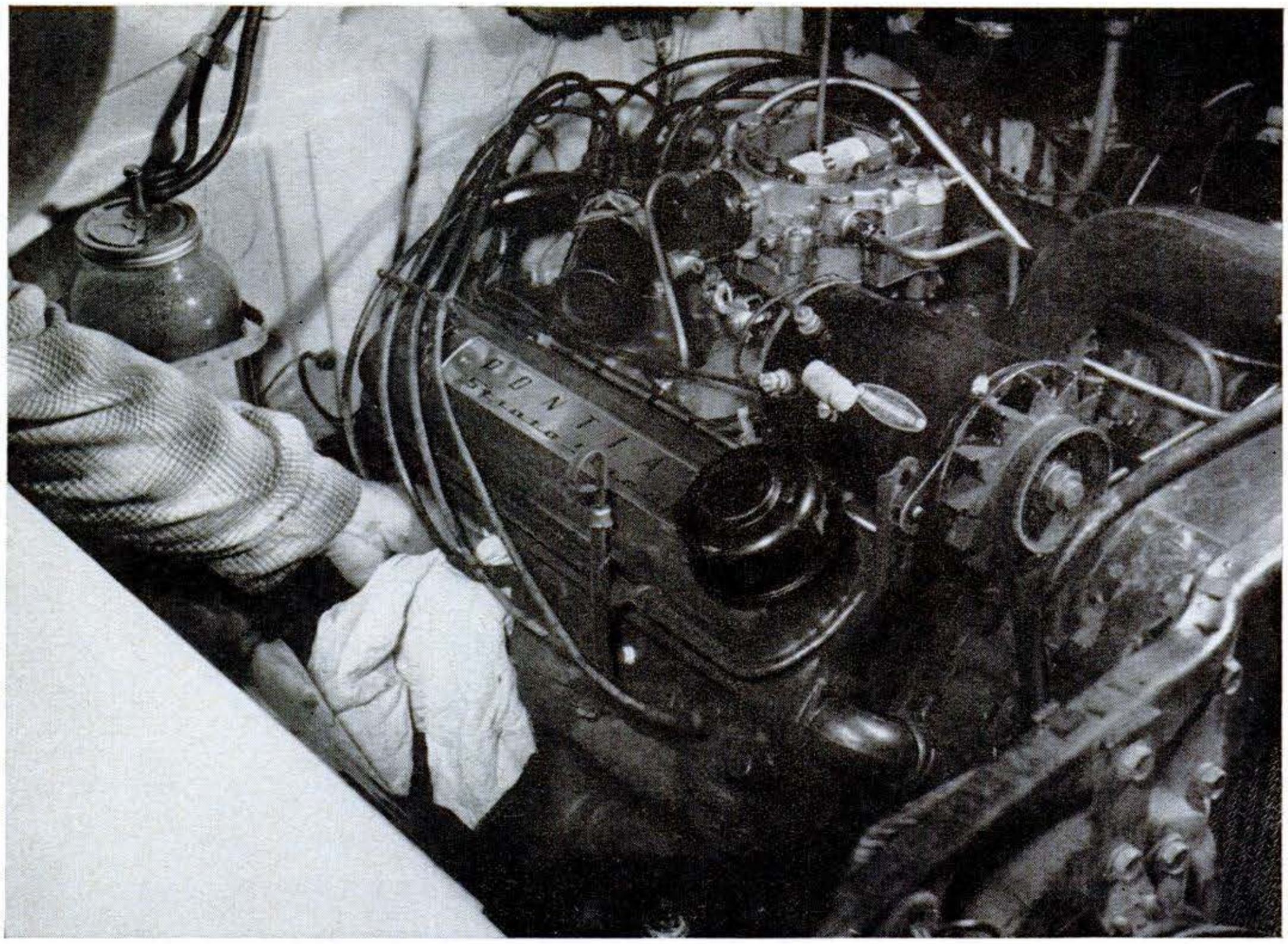


FLUSH OFF THE DIRT with *hot* water. The emulsified grease runs off easily, leaving the engine bright. If your home doesn't have a utility sink, you can buy an adapter to connect the hose to the hot-water faucet of your kitchen sink.



TO COMPLETE THE JOB, apply the degreaser to the firewall, splash shields inside the fenders, and under the car on the oil pan and transmission housing. Hose these parts down with hot water, mop off any residue and wipe dry.



WIPE THE PLUGS DRY with a cloth and remove the plastic wrapping from the carburetor, coil and distributor. Wipe the ignition wires dry and push them firmly into the distributor-cap terminals and start the engine. If it balks, squirt some carbon tet on the plugs to remove any remaining moisture. Move the car and scrub the driveway with any left-over degreaser. The stuff is good for grease spots and oil drippings on concrete carport and garage floors, too.

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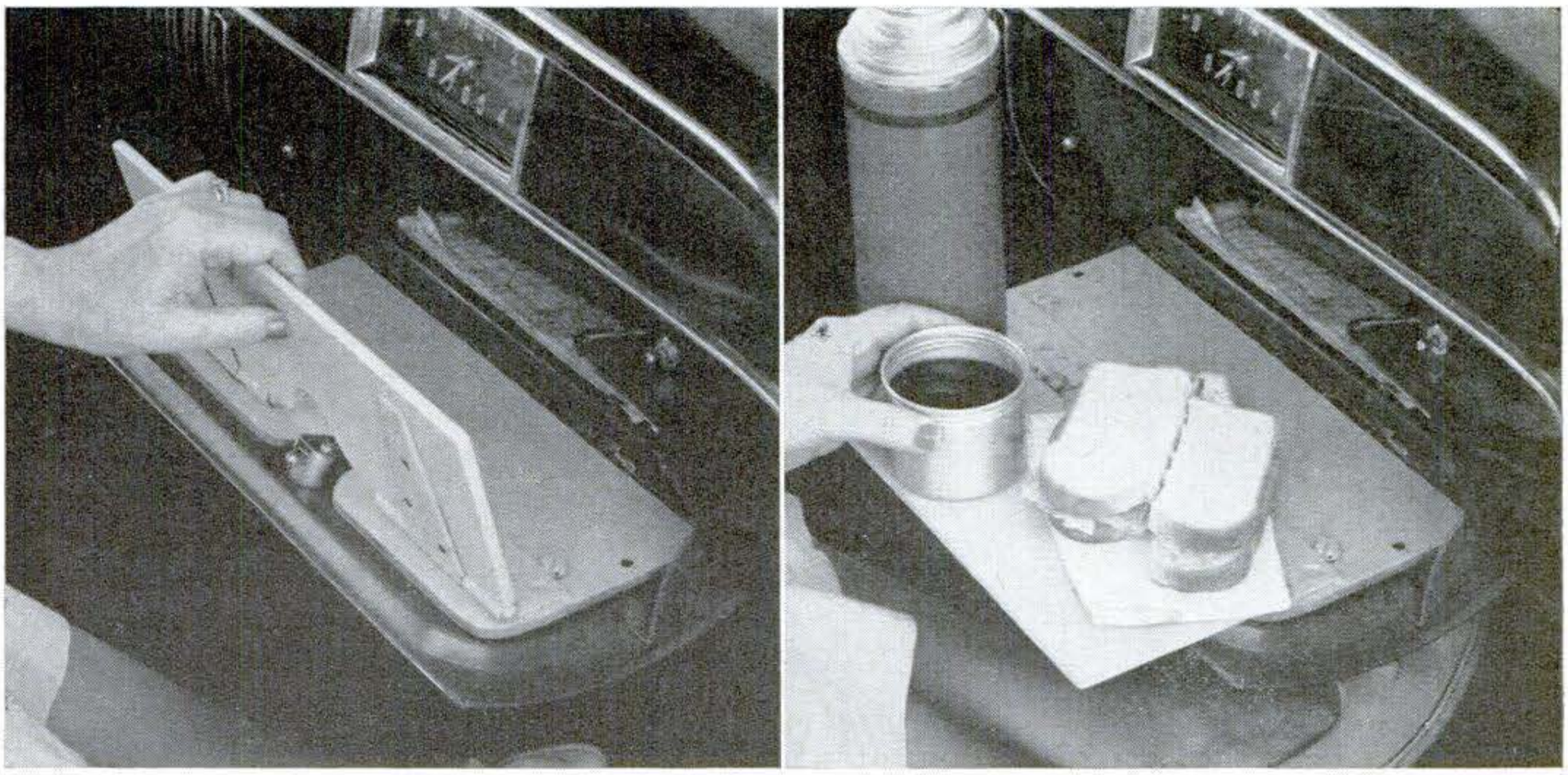
Exposed License Plates? Guards Keep Them Dent-Free

A LICENSE plate on a front bumper may be in for a direct hit unless the car manufacturer has provided a recess for it. One way to protect an exposed plate is to put extra bumper guards around it. The ones shown were made for the rear of a station wagon. Being interchangeable, they conform to the straight bumper section.



Dashboard Dinette for Roadside Snacks

Two pieces of plywood or hardboard, fastened together with strap hinges, make a convenient fold-away snack shelf when attached to the inner face of a glove-compartment door. A notch in the edge of each piece lets the shelf clear the lock in both open and closed positions. Self-tapping metal screws hold it to the door.

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Gently he rocked the cylindrical float back and forth. Its weight seemed to shift from side to side

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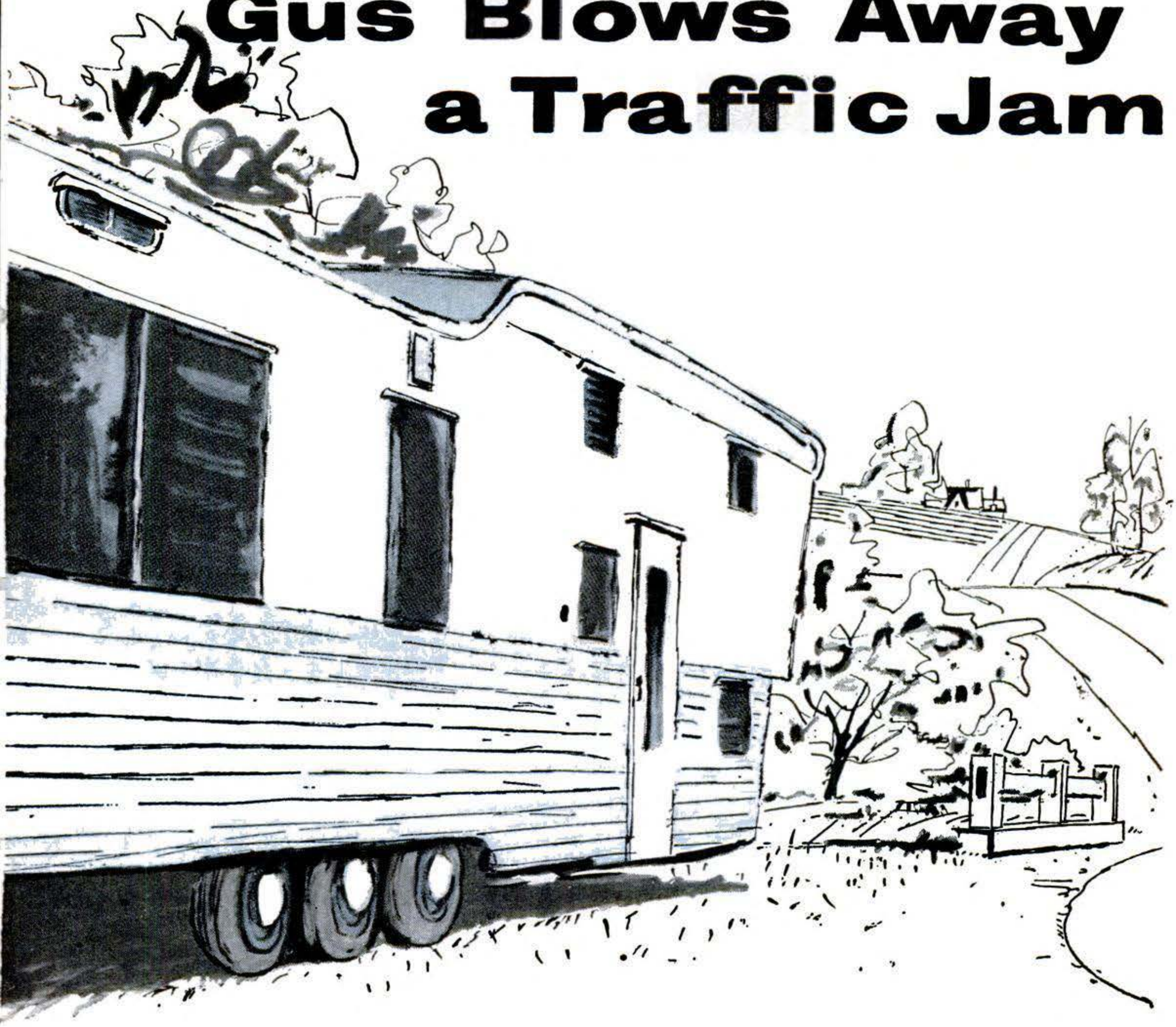
Gus Blows Away a Traffic Jam



By Martin Bunn

GUS WILSON was installing a new clutch in the Model Garage service truck when his helper took a phone call in the office.

"A man by the name of Prouty," Stan reported. "In a hurry. Headed this way—but says his car won't pull the Birch Mountain grade."

"Won't pull the grade, eh?" Gus said. "Probably nothing much wrong. I'll run out there in my car . . ."

Topping Birch Mountain some 10 miles out from town, Gus came down the steep grade on the far side. As he neared the bottom he saw a heavy sedan parked on the shoulder. Hitched to it was a massive house trailer—it seemed to Gus nearly 40 feet long. He stopped.

A short, stoutish individual bustled over.

"Gus Wilson?" he inquired, seizing Gus's hand and pumping it vigorously. He peered into Gus's face through thick-lensed glasses that gave him the appearance of a genial barn owl. "My name's Ebenezer Prouty, Grand Exalted Wagon Master of the Friends of the Open Road."

"Grand exalted what?" Gus asked, gazing at the monstrous trailer.

"Wagon Master," Prouty said. "I'm the man who goes ahead to arrange for the rendezvous of the Friends—but no matter. Fix my car so I can get under way. I'm due in an hour."

"I see," Gus said, although he didn't. "That's a pretty big trailer to pull with a car, isn't it?"

"I've got a state permit to pull it," Prouty said. "Never have a bit of trouble

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when the car is running up to form."

"You don't say," Gus said.

"That's right. But right now this car wouldn't pull the hat off your head."

GUS got behind the wheel, started the motor. He gunned it, listening to the engine stagger, falter, lope, shake in its hangers. The symptoms were as familiar to him as the ringing of a phone.

"She's loaded up on gas," Gus said.

"Now that is what I call efficient mechanical detection, Wilson," said Prouty. "As Wagon Master for the Friends, I have to make efficiency my byword. No doubt you have the remedy, Wilson?"

"It isn't that simple," Gus said. "Loading up could be caused by a number of conditions—faulty fuel pump, clogged air cleaner, clogged air-mixture passages or jets, a faulty float-needle seat in the carburetor, or a faulty automatic choke. I'll have to run it down."

"Well, let's get on with it," Prouty said, glancing at his watch. "I simply must get into town immediately."

Being accustomed to clients in a hurry, Gus went to work in his usual systematic manner. He disconnected the fuel-pump line at the carburetor, turned the motor over with the starter. A satisfactory flow of gas resulted, but having no pressure-analyzing gauge, Gus couldn't be sure that pump pressure wasn't too high.

He removed the air cleaner, washed out its element with gas from a can in his car. Next he cleaned the hot-air screen of the automatic choke and saw that the parts worked freely. He checked and set the carburetor float level, and with a tire pump from his car, blew out the carburetor jets, paying close attention to the air-mixture passages.

With the parts back in place, he tried out the engine. Again it loaded up, loped, shook in its hangers.

"Really, Wilson," Prouty said worriedly, "this can't go on. I simply must get to the rendezvous."

"Figuring this one out," Gus said, "may take a little time, and I certainly can't tow your heavy rig in, even if I had a trailer towing hitch. Excuse me, but just what is your hurry, Mr. Prouty?"

"As Wagon Master for the Friends of the Road, I have considerable responsibility," Prouty said. "If this trailer of mine isn't parked where it is supposed to be by noon, in plain sight of the main highway, the Friends will be running around in circles. Two hundred of them."

"Two hundred!" Gus echoed.

"At least," Prouty said. "The Friends are an organization of folks who own house trailers. Several times a year we pick a central point for a rendezvous."

"I see," Gus said. "And what does this trailer have to do with it all?"

"As Wagon Master," Prouty explained, "I am advance man for the rendezvous. I have made arrangements with a contractor in your town, Mr. Matt Henderson, to rendezvous on some vacant land where he is starting a new subdivision. None of the Friends knows exactly where this spot is. Each has been informed by mail that my house trailer, which is well known to all, will be parked on this tract, in sight of the main highway as they drive through town.

"Not only must I act as decoy, Wilson, but I must direct each trailer into a spot in a huge circle, using the loudspeaker system on my trailer. If I am not there by noon, the Friends are going to be very annoyed with me."

"Not half as annoyed," Gus said solemnly, "as a policeman named Jerry Corcoran is going to be with me, *if* I let 200 house trailers come into town to circle around in traffic, not knowing where they're going. It would be a madhouse."

"Precisely," Prouty said. "Perhaps we had better fix my car."

"Perhaps we had," Gus agreed as he dove back under the hood.

He knew that if the fuel pump *was* delivering too much pressure, it could be overloading the engine with gas. The trouble might also be in faulty seating of the carburetor-float needle. Another possibility, and the easiest to check, was the automatic choke. Gus removed the air cleaner, started the engine, and held open the butterfly of the automatic choke while he gunned the engine. When it loaded up and loped, the carburetor becoming wet outside with gas, he knew that the choke was not responsible. His suspicions fixed on the carburetor.

THIS time Gus really pulled the offending unit apart, searching for clogged passages, loose or worn jets, a jammed float needle or float. Removing the latter to inspect the needle seat, he

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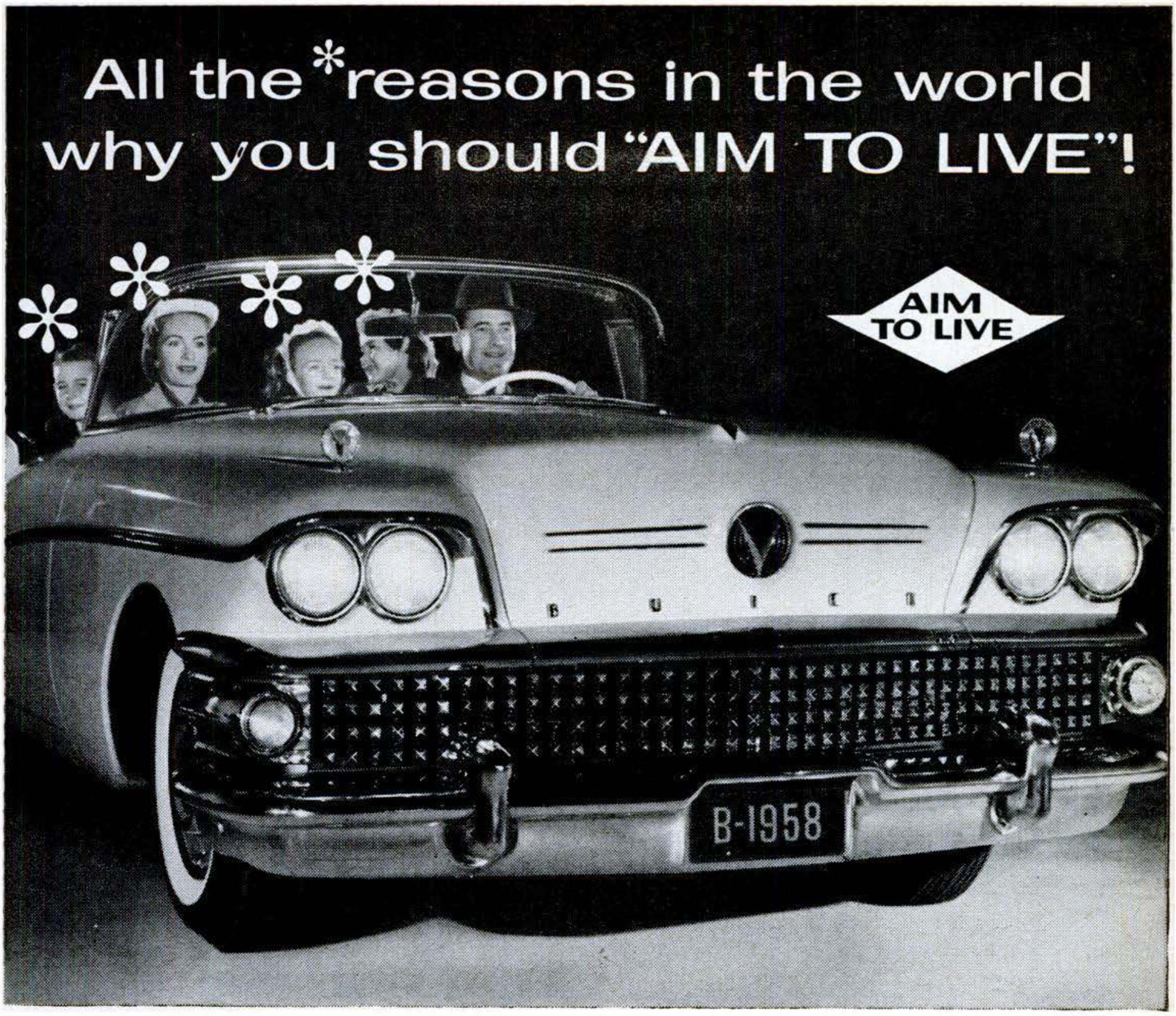
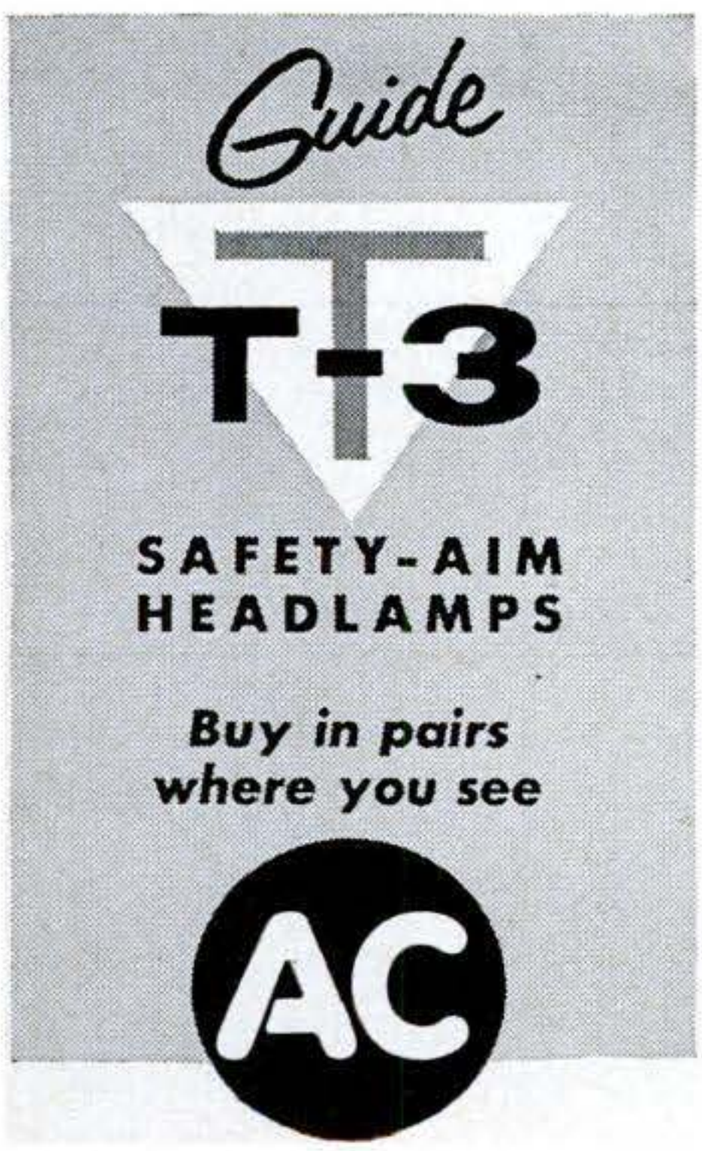
All the *reasons in the world why you should "AIM TO LIVE"!





Give your family, and yourself, the extra protection afforded by new Guide T-3 Headlamps—aimed right, as they can be day or night! It is only a matter of minutes to have them aimed. Then you're sure of all the latest scientific light-beam direction approved by lighting and safety authorities.

Get Guides—ask for them by name and have them aimed. You'll then have stepped-up light power and the pattern of light on "full" or "dim" that is safest for you and for other drivers. For added safety make a habit of dimming your headlamps whenever you approach another vehicle. Take this precaution, and "AIM TO LIVE."

Watch Walt Disney Studios' ZORRO every week on ABC-TV

AC THE ELECTRONICS DIVISION OF GENERAL MOTORS

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reached over to set it in a safe place on the fender. In midair his arm froze.

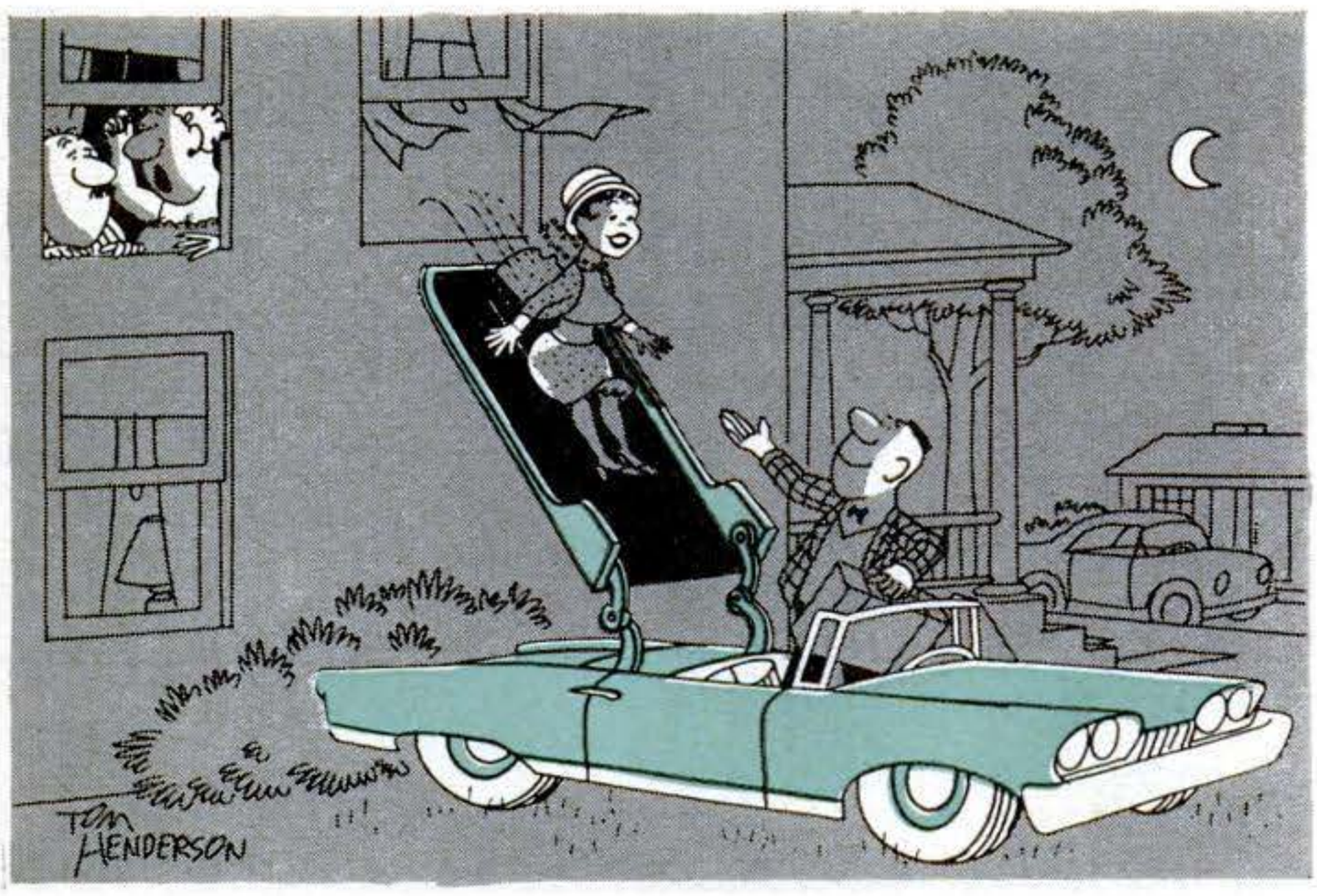
Gently he rocked the cylindrical float back and forth in his fingers. Its weight seemed to shift from side to side.

"Ah!" he breathed. "We've got it."

"Got what?" Prouty snapped.

"There's some gasoline inside this float," Gus said. "That makes it float low and logy. Instead of shutting off the gas, it lets the level rise in the bowl, so your motor loads up and stalls."

Gus shook the float hard, searching for the place where the gas had entered.



"And YOU said: 'Nice convertible. That boy is going places!'"

"Can't seem to locate the leak," he said. "It's probably so small that this gas has taken weeks to seep inside."

"How are you going to get it out?"

"There's only one way."

Reaching into his kit for a push drill, Gus fitted on a 1/16-inch bit. He drilled a hole in one end of the float, put his lips to it, and blew mightily. On the surface of the float now he was able to detect a hair-like crack, revealed by a seepage of gasoline forced out by the air pressure.

Gus drained the gas out of the float through the hole he had drilled, then with his six-volt soldering iron laid a film of solder over the drilled hole and the crack. After reassembling the carburetor and installing it, he buckled down the hood. "Try her now," he said.

The engine surged to life, buckled down to a smooth purr.

"That does it!" called Prouty. "I must be off!"

"Right behind you," answered Gus.

ROARING in low gear, the big sedan buckled into the grade, hauling the huge trailer easily behind. Gus followed it to Matt Henderson's newly cleared subdivision property south of town, then drove back to the Model Garage.

Getting out of his car he saw a long trailer disappearing around the corner. As he was washing up, it appeared again. The man driving the car that hauled it had a stunned expression. Gus stepped outside.

"Hey, friend," the driver called to Gus. "Where can I find the Wagon Master's rig?"

"Turn south at the next corner, friend," Gus called back. "Go half a mile beyond the city limits, and you'll see the rig you're looking for, parked on a knoll. It wasn't there a few minutes ago, or you'd have spotted it coming into town."

"Thanks, friend." The man drove on.

"What's this 'friend' business?" asked Stan. "That guy's a stranger, isn't he?"

"Not to the right people," retorted Gus. "Whom you and I will meet tonight at the big dinner. We're going by special invitation of the Rendezvous of the Friends of the Open Road. I'm betting it will be a fine feed."

It was. Sitting within the circle of trailers that evening, before a glowing cookfire, Gus listened with well-fed contentment to 300 voices raised in song. Then, looking around at the great bulks of the 200-odd trailers, he let out a slow whistle.

"Huh? Anything wrong?" asked Stan.

Gus grinned. "I was just thinking what could have happened in town today—if I'd run out of wind there on the Birch Mountain grade." END

Next month: Gus settles a dispute.

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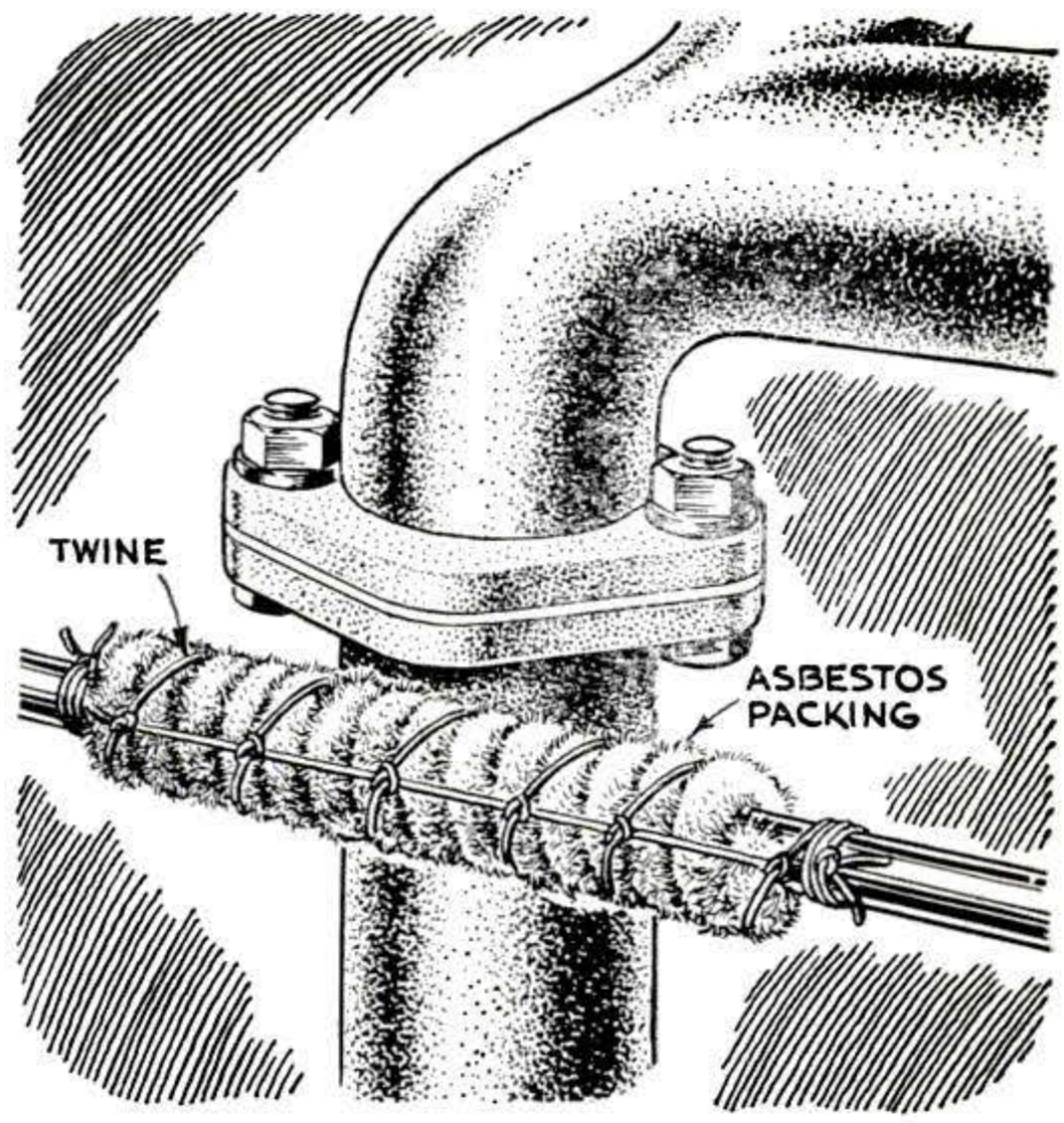
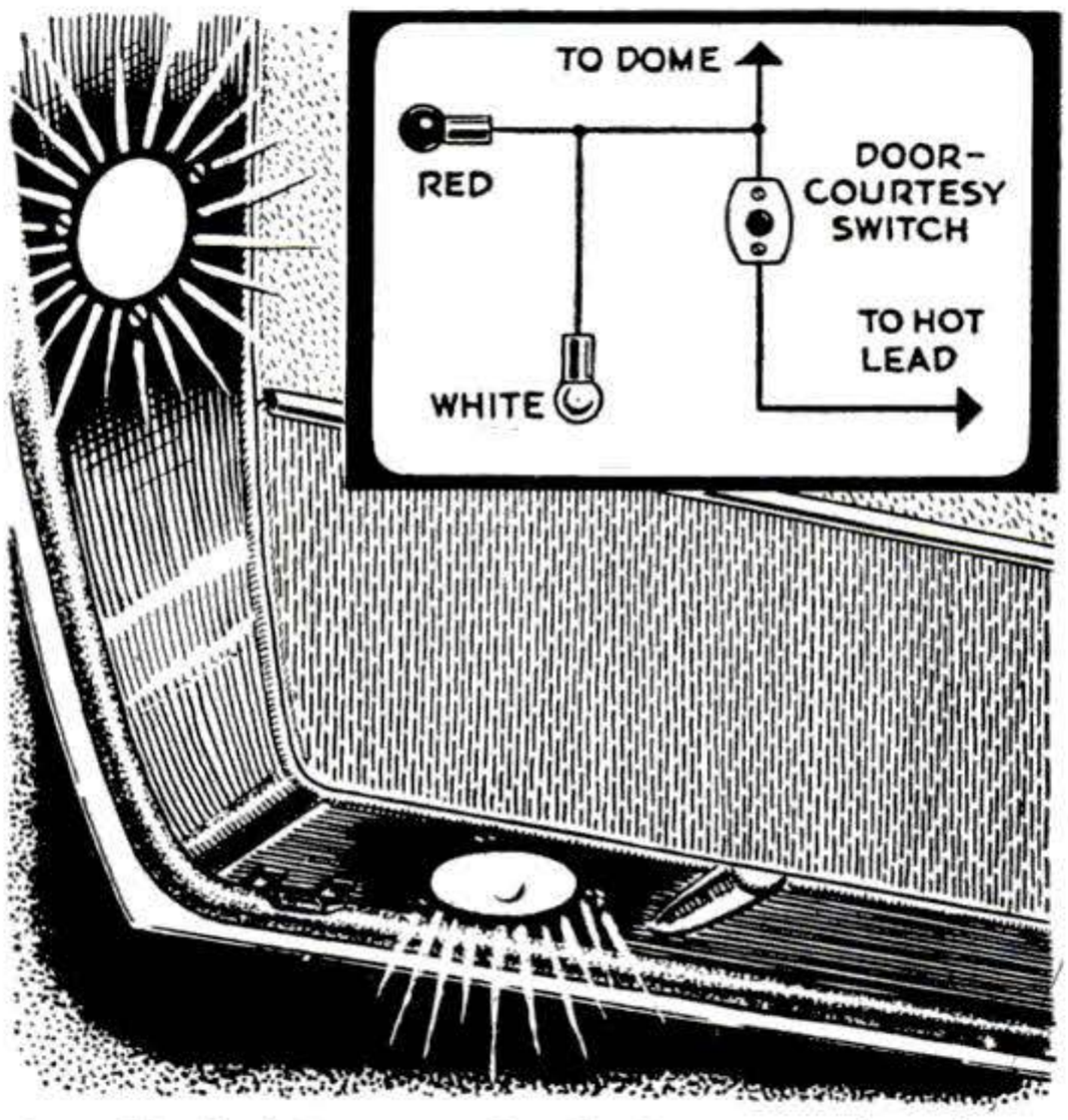
Hints from the Model Garage

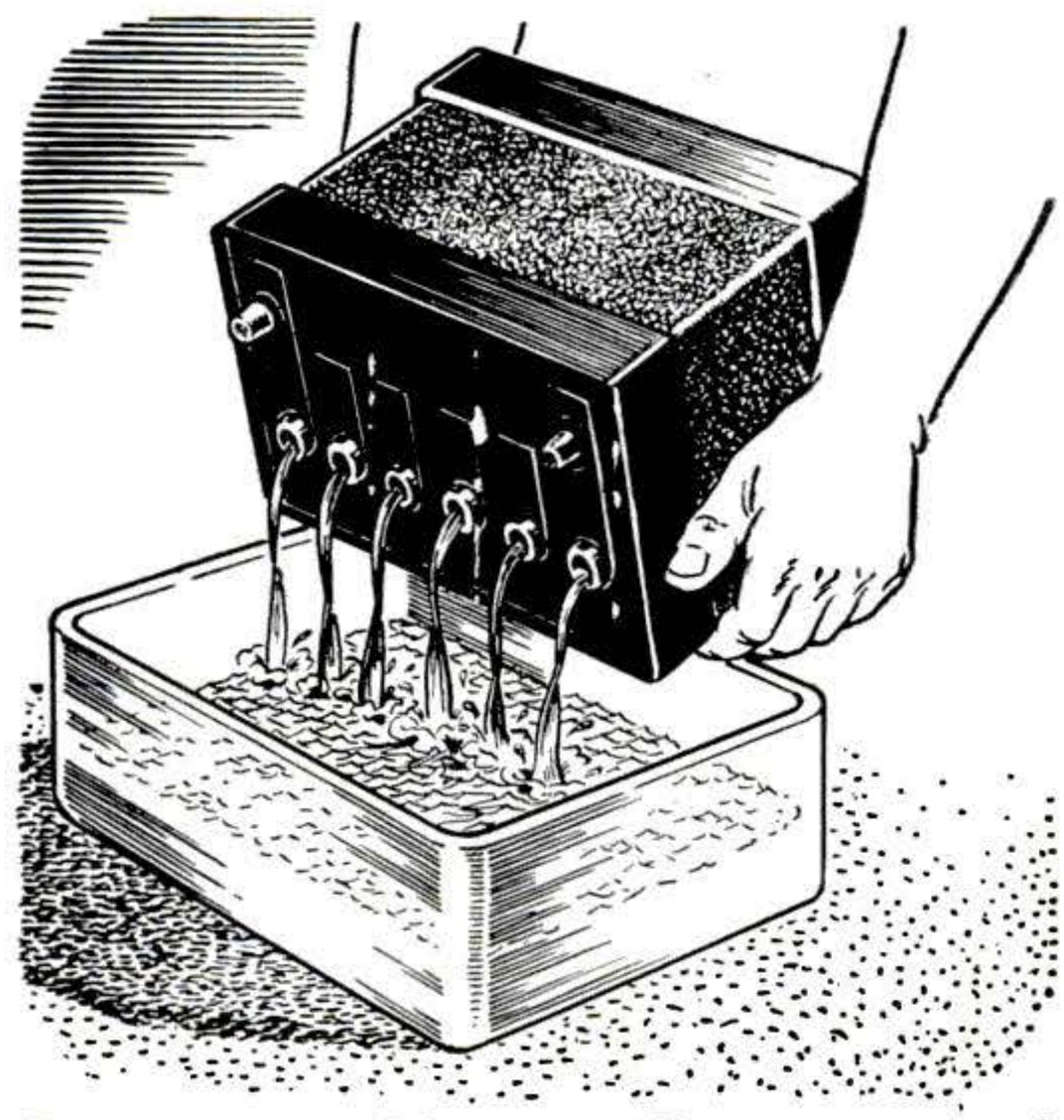
Those big, modern stop lights are brilliant enough to serve as backup lights. To make them go on, touch your brake lightly when backing, or connect them to a separate backup-light switch mounted on the lower end of the steering column.



To prevent vapor lock if the fuel line passes near a hot manifold, insulate the line with asbestos packing. Wrap the packing around the gas line, wet it with water and squeeze to compact it, then bind it tightly in place with twine.



Small lights set in holes cut in door edges will warn approaching cars and illuminate the ground where you step down. Connect the lights to the courtesy-light switch and protect the wire with plastic tubing where it enters the door.



Extra years of battery life are reported by a motorist who flushes out plate sediment with water when a cell appears shorted. He pours the electrolyte into a baking dish, flushes all cells, puts back the electrolyte and charges the battery.

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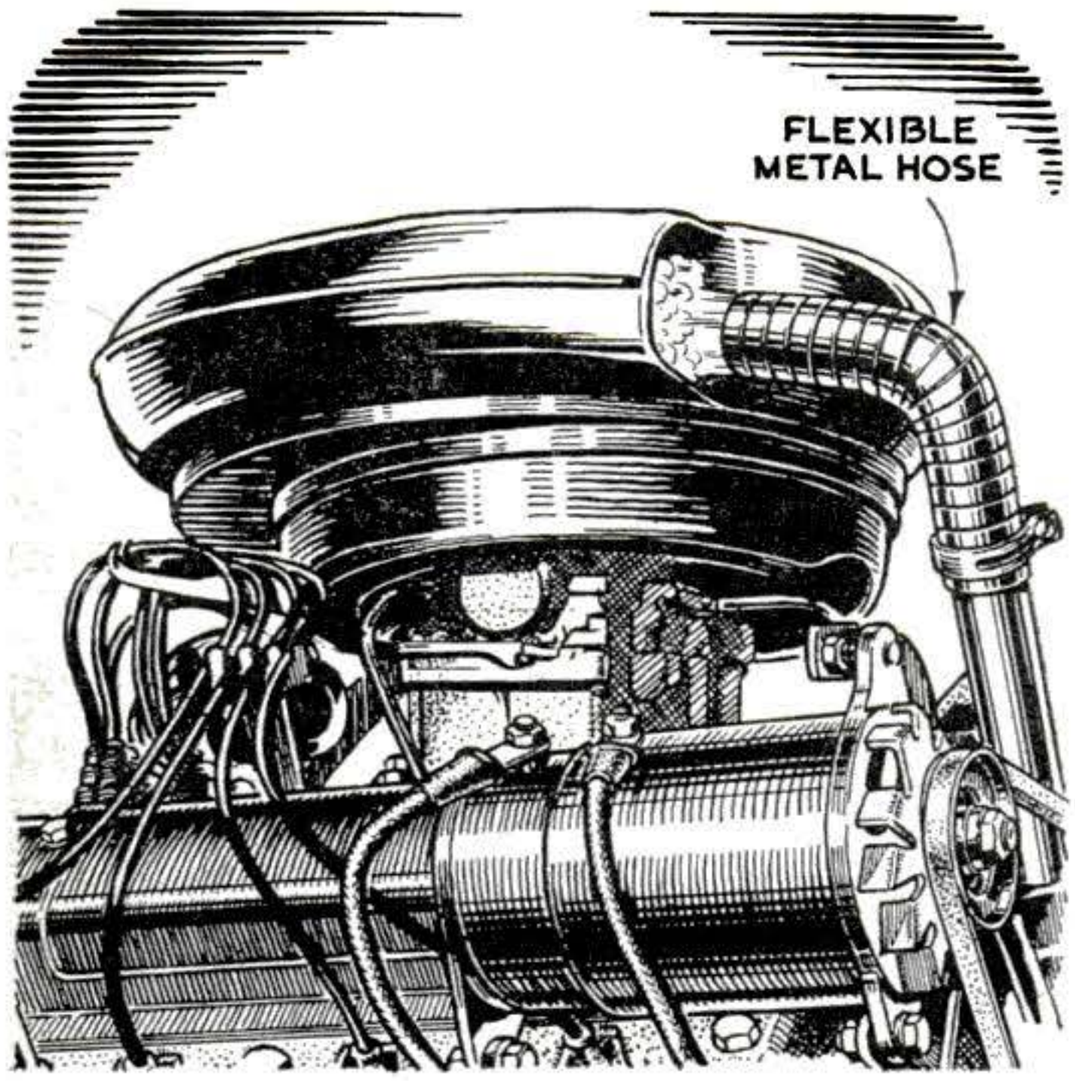
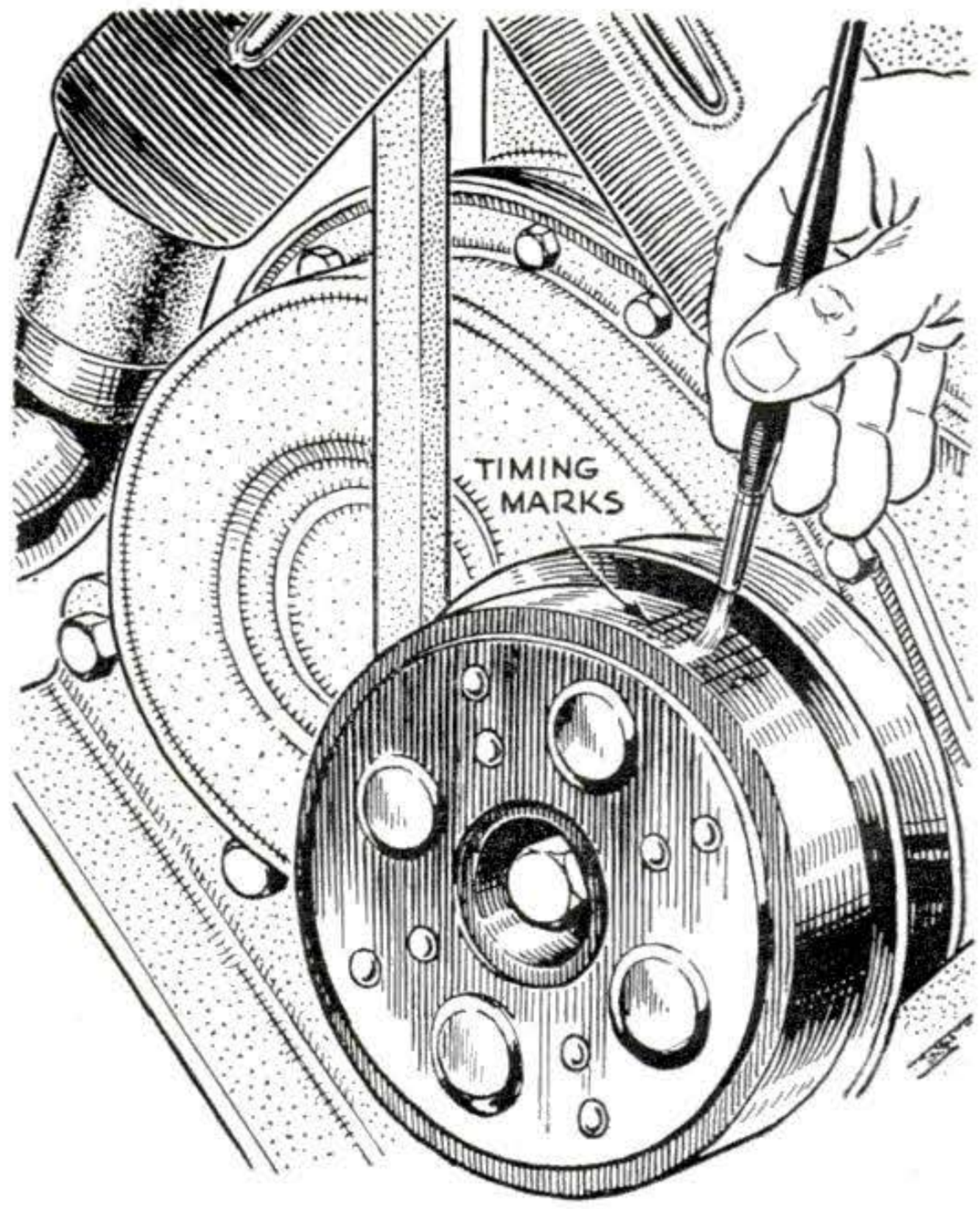
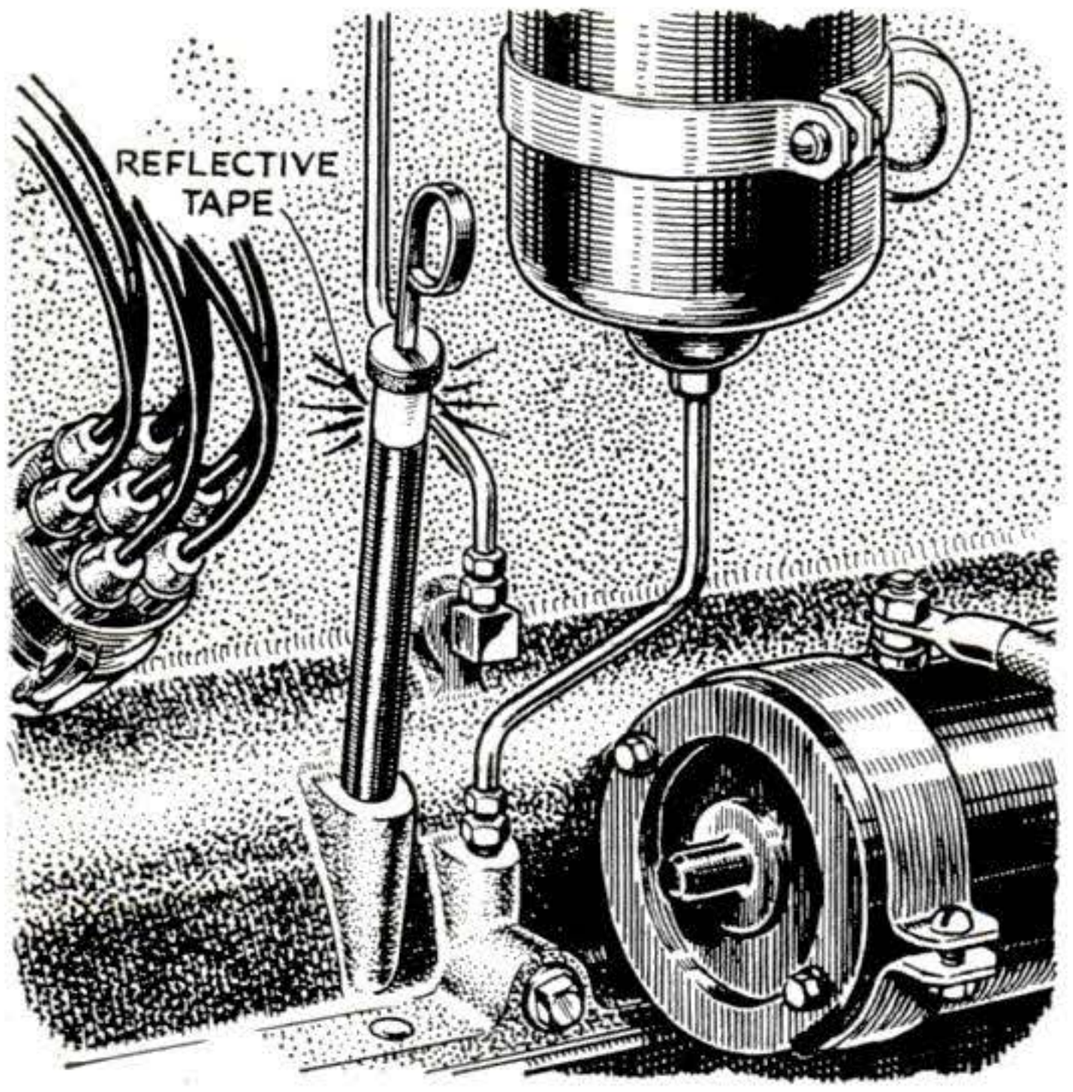
More Hints from the Model Garage



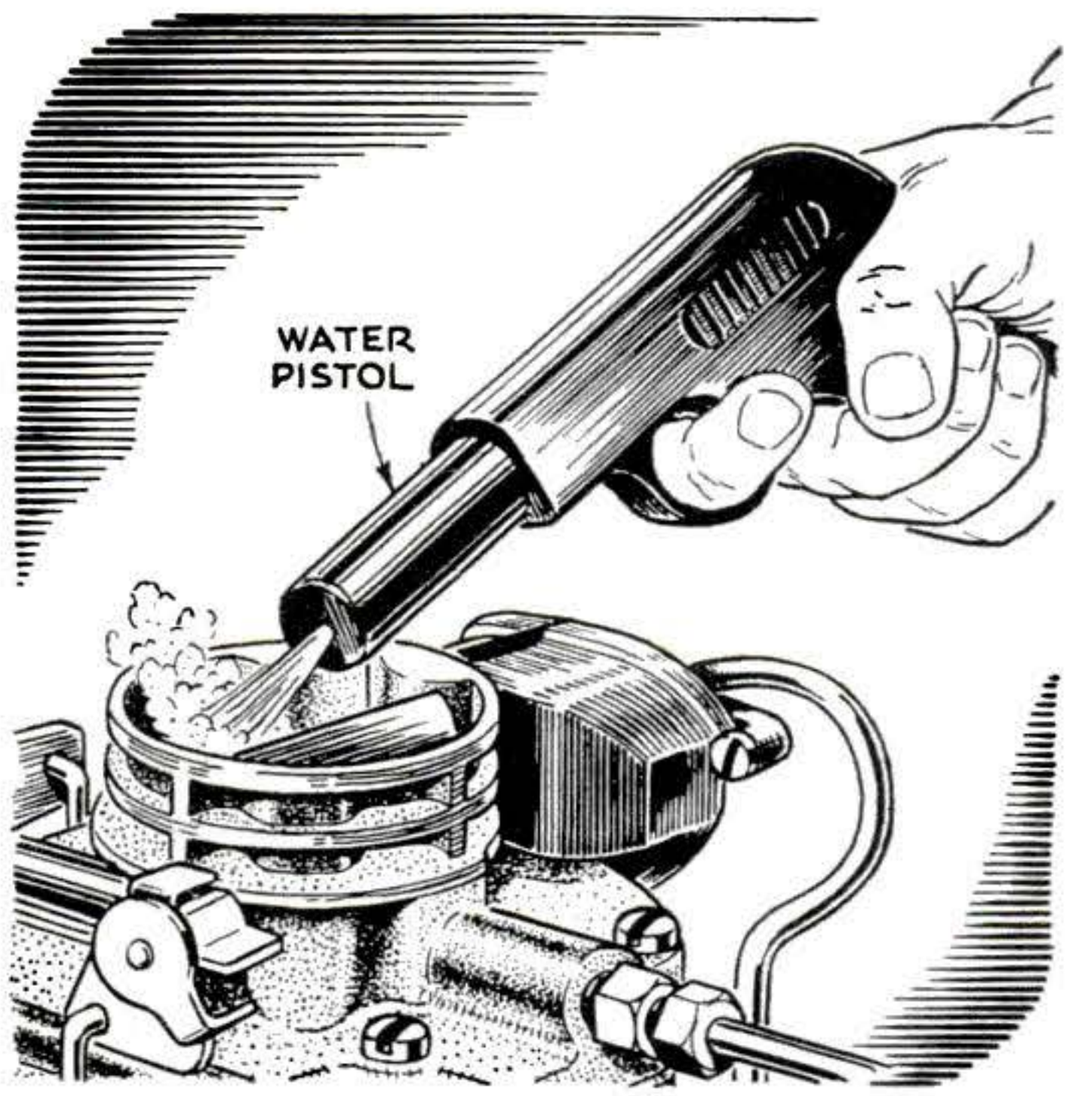
Got an oil pumper that puffs clouds of blue smoke up through the filler pipe? One mechanic eliminated the smoke by diverting it into the carburetor through a short length of flexible tubing. Now the oily vapor lubricates the valve guides.



Timing marks will stand out vividly under the beam of a timing light if they are wiped clean and painted with thin stripes of luminous paint. The paint, available at hardware and art-supply stores, glows when illuminated.



Wrap the top of the crankcase dipstick tube with white reflective tape to make it visible in the shadow of the hood at night. The tape will reflect any feeble stray light, making it easy to replace the dipstick after checking the oil level.



To start a balky engine or save cranking to prime the fuel system after running out of gas, fill a metal water pistol with gas and squirt it into the carb's throat. This is better than *pouring* in gas; the gun breaks it up into a fine spray.

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How to Trouble-Shoot a Tape Recorder

By Norman Crowhurst

WHEN a tape recorder loses its loud, clear playback voice, it is often discarded, shoved onto a closet shelf or into an attic corner to gather dust. That doesn't happen when your TV set, radio or hi-fi develops vocal quirks; you *treat* their ailments and keep them fit for years of enjoyment.

There is no reason why your tape recorder should be treated as a stepchild. A little trouble-shooting know-how will enable you to prolong the life of almost any machine that starts to show signs of wear—begins to whisper hoarsely, whine, hum, hiss, or sound thin and tinny.

Making the diagnosis. The chart following lists the main symptoms and what may be causing them. First check the symptoms against the performance of your tape recorder. In most cases you'll

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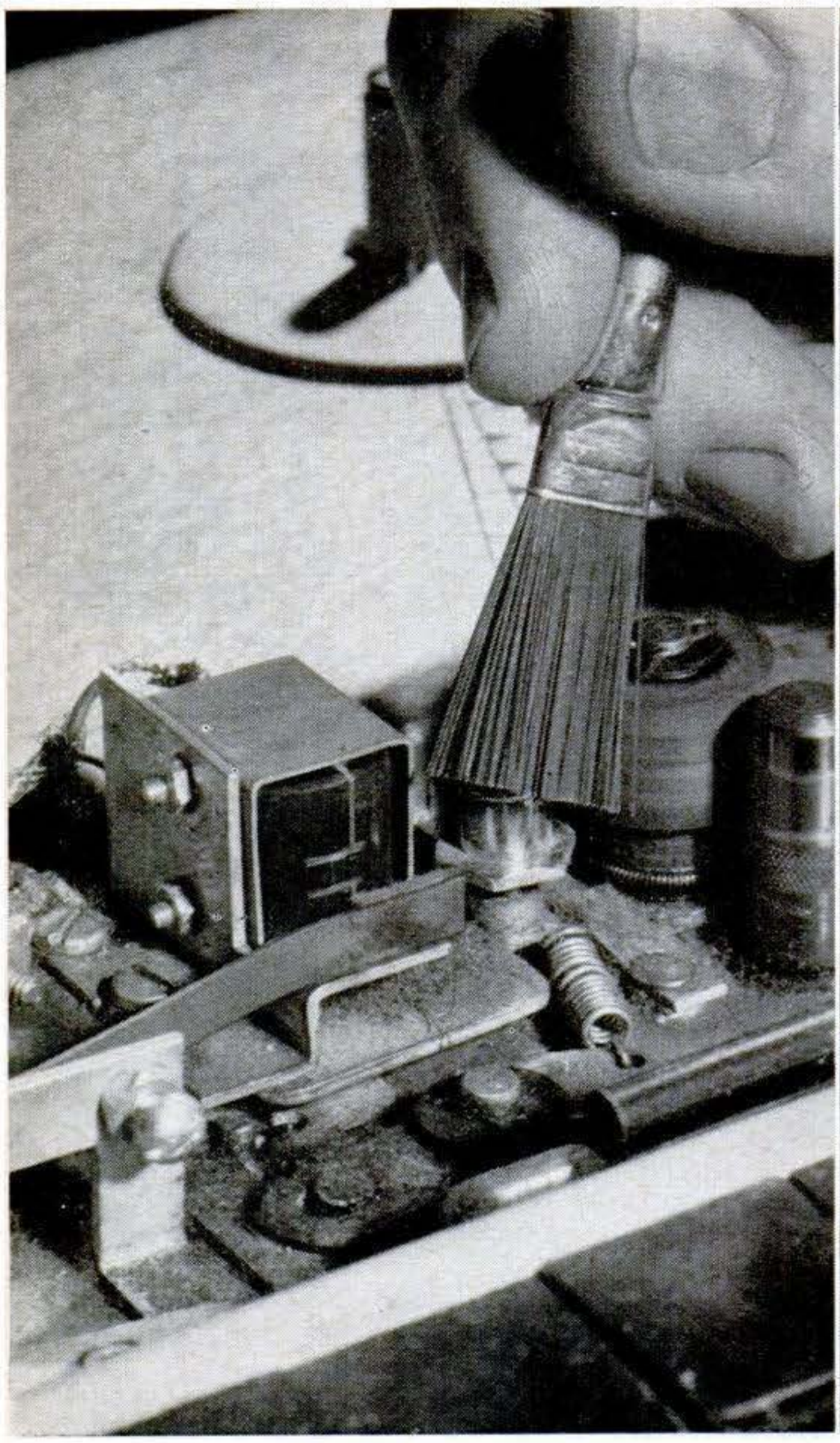
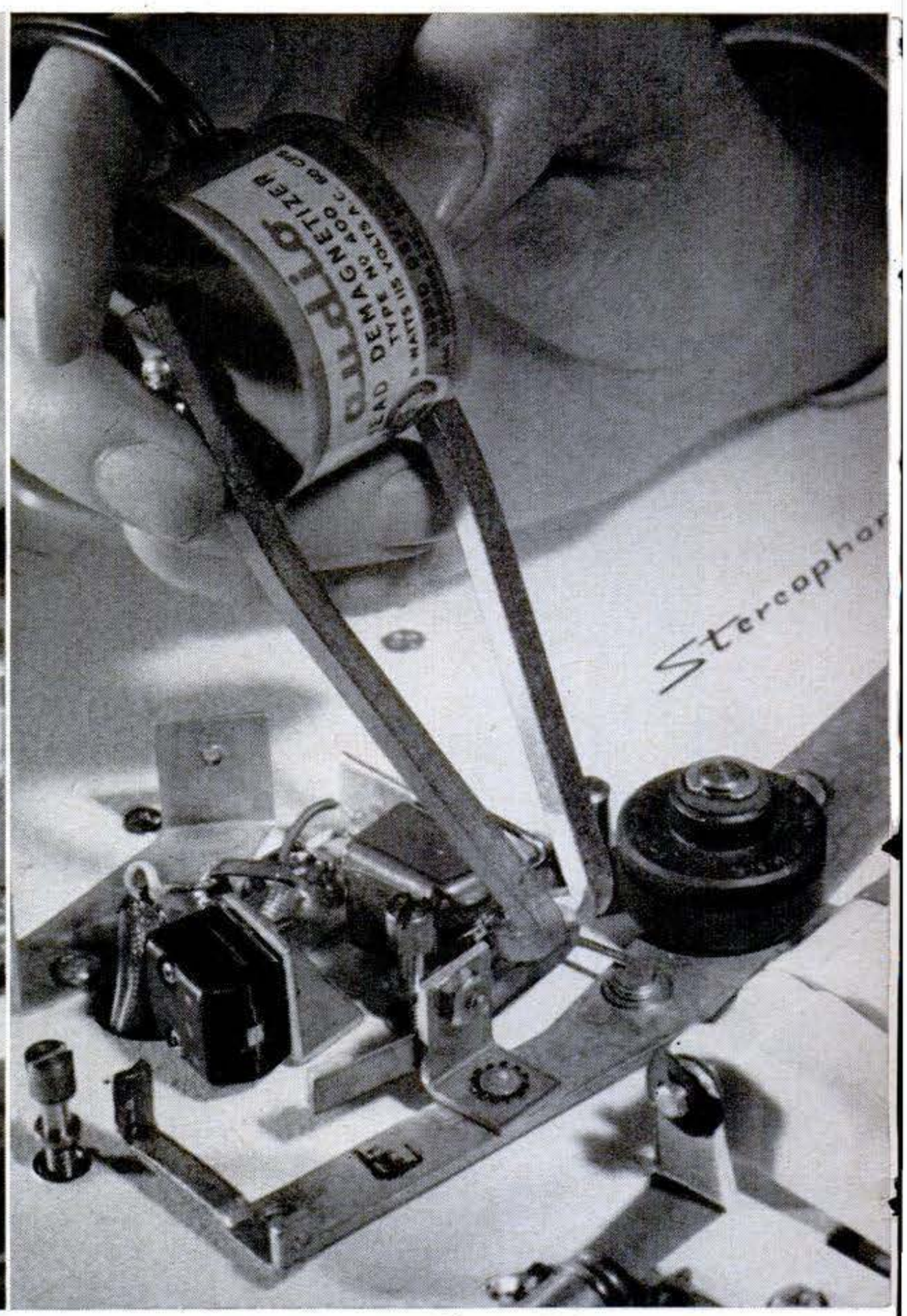


CLEAN THE RECORD-PLAYBACK HEAD frequently. A stiff brush will do for routine cleaning, but periodically do a thorough job. Dip a cloth swab in a solvent such as alcohol, lacquer thinner or a special head cleaner, squeeze it almost dry and rub the surface of the head. Never scrape it.



DEMAGNETIZE THE HEAD with an AC magnet. Remove the cover plate to gain access. Plug the head demagnetizer into 120-volt AC, place the poles in contact with the recorder head, then slowly pull it several inches away from the head before disconnecting it from the power.

find more than one, which is also true when you check back on the cause.

Loss of output, for instance, can be due to seven types of defects. If you also discover loss of treble, some distortion, and noises like hissing steam, you may, perhaps, conclude that the oscillator is out of adjustment. But hold it. A magnetized head can be responsible for the same ailments, plus hum and loss of bass. But the last two may not necessarily be showing up. So, if one treatment doesn't work, try each one indicated in turn until the patient responds.

Now for the cures:

Dirt on the head. Picked up from the tape, it usually forms as a small black blob right over the gap on the tape head. Removing it without damaging the head is a delicate operation. A good brush with stiff plastic bristles—the kind that's on the back end of a typewriter eraser—usually will do the job. In some tough cases you may need the aid of a liquid head-cleaner or alcohol to loosen the dirt. *Never* scrape the head with any metallic or hard object.

Magnetized head. The recording head tends to become permanently magnetized in the course of operation. It's best cured with a special head demagnetizer, although a bulk demagnetizer, designed for demagnetizing whole reels of tape, can be used on recorders that don't have permanent magnet erase. Put the bulk type about an inch away from the heads. The

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Symptoms of Tape-Recorder Troubles and Probable Causes of Each Defect

Symptom \ Probable Cause	Dirt on head	Head magnetized	Head incorrectly aligned	Head badly worn	Bias oscillator incorrectly adjusted	Drag brake worn or too tight	Take-up drive not correctly adjusted	Capstan eccentric, or drive poor	Pressure pads worn or poorly adjusted	Amplifier tube defective	Defective component in amplifier	Bad contact in switch or connecting leads
Loss in gain or output	✓	✓		✓	✓					✓	✓	✓
Loss of treble or highs (definition)	✓	✓	✓	✓	✓						✓	
Loss of bass		✓									✓	
Distortion		✓			✓					✓	✓	✓
Erratic quality (changes during playing)	✓					✓	✓		✓			✓
Wow or flutter						✓	✓	✓	✓			
Hum	✓	✓		✓						✓	✓	✓
Noise (background hiss)	✓	✓			✓				✓	✓	✓	✓
Complete failure										✓	✓	✓

MOST FAULTS WILL NEVER HAPPEN if you use the vertical-column headings on this chart as a guide to regular maintenance. In particular, the record-playback head should be cleaned and demagnetized after eight to 10 hours of operation. Before assuming that the recorder is at fault, check the recording level you are using. Over-recording will cause a loss of clarity; under-recording will result in a high noise level.

head demagnetizer should be placed in contact with the head. Then switch it on and move it some distance away before switching off. Remove the tape first if it has a program you don't want erased.

Head misaligned. Check first. Use a pencil to guide the tape and change the angle at which it passes the head. (A fraction of a degree will make a noticeable difference.) You can buy a special alignment tape for this job, but a high-quality prerecorded tape with plenty of extreme treble will do almost as well. If the high-frequency quality improves as you move the tape, an adjustment is needed.

Some recorders have an adjustment for this. If yours doesn't, you'll have to use shims. Loosen the head-mounting plate, insert a piece of paper or cardboard under one edge so as to cock the head slightly in the desired direction, tighten down, and try again.

Occasionally the tape may pass the heads at the wrong angle because the guides have shifted or become bent. To fix this, straighten or realign the guides.

Badly worn head. The fine magnetic gap of the playback head may be so worn down that the higher frequencies disappear. If you can see wear marks on the face where the tape rides, get a new head. If yours is an older machine, you often can get a replacement head that is better than the original was when new.

Bias-oscillator adjustment. The bias

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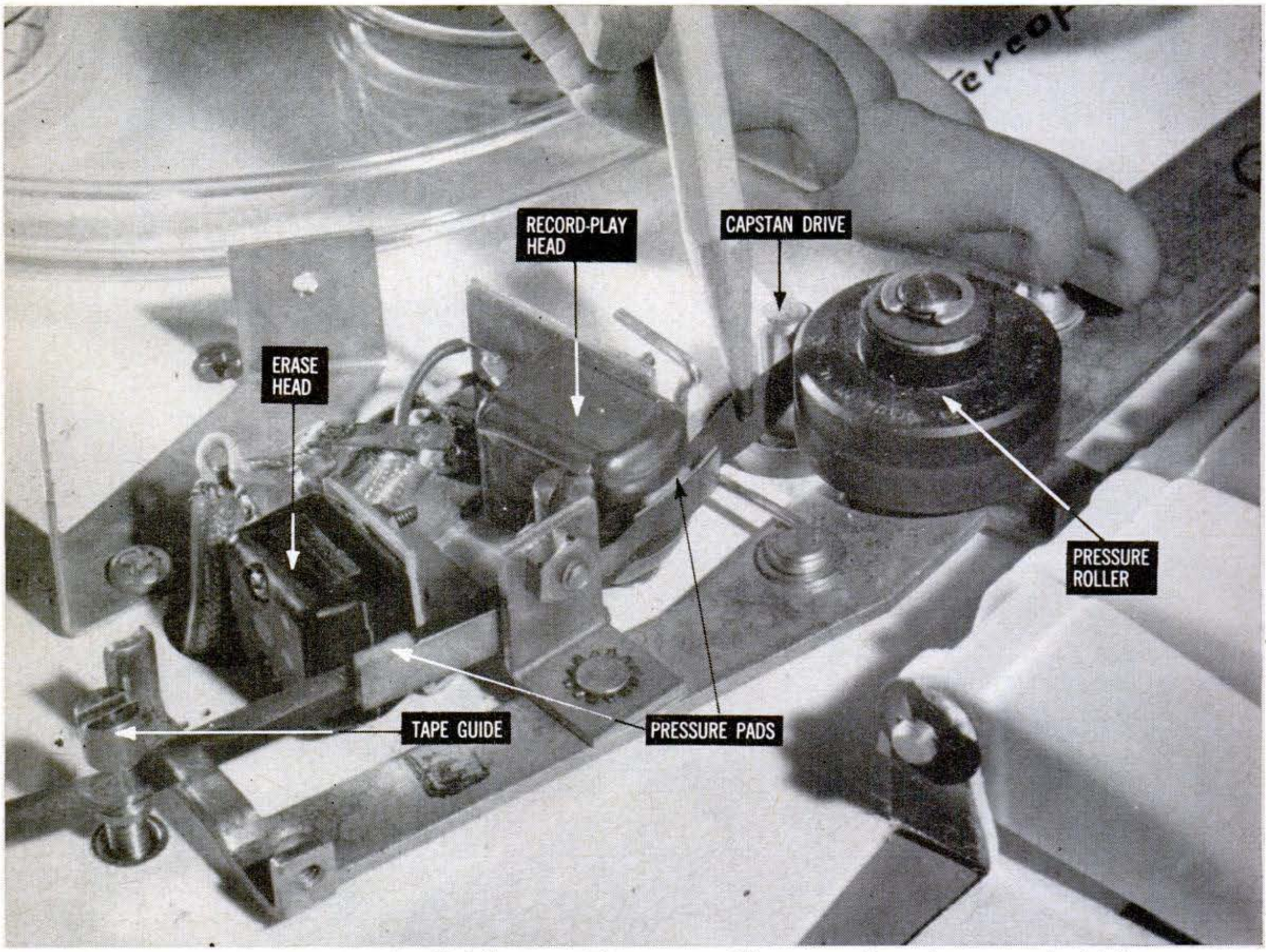

TEST THE HEAD ALIGNMENT, pressing lightly on the edge of the tape between the head and the capstan while the machine is playing. This will alter the angle at which the tape passes the gap. If pressure either up or down improves the high frequencies, the head should be aligned. If no adjustment is provided for this, use shims between the head and mounting plate.

oscillator itself may go out of adjustment, or a faulty tube may be causing a bad wave form. If you have to change a tube, you might as well readjust the oscillator at the same time. Otherwise, check other possible causes before tinkering with the bias adjustment.

Too much bias causes loss of extreme high frequencies. Too little results in excessive noise and distortion in the recorded program. The easiest way to adjust is to make some sample recordings at different settings. Be sure to note how you have the control set on each "run" so that you can go back to it if it proves to be the best one.

Drag brake worn or too tight. The brake should provide just enough tension to keep the tape from running slack and then snatching, or from squeaking or shuddering as it passes the first guidepost. Usually there is a felt washer under the hub of the spindle to provide the friction to hold back the supply reel. This felt should be replaced when it gets badly worn. But, otherwise, you can restore the proper drag by putting paper or cardboard washers under it. Some recorders make it easy by providing a special adjustment to make up for wear.

Both the supply and take-up spindles have brakes to stop the reels after fast forward or rewind. If you have trouble with tape spilling, replace both these pads. If your machine uses separate motors for take-up and rewind, drag and braking is usually done electrically and will not ordinarily require attention.

Take-up drive troubles. If there is any flap, snatch or bounce to the tape between the capstan and the take-up reel, it may cause wow or flutter in the sound. A worn or slack take-up drive belt is often the trouble. Replace it.

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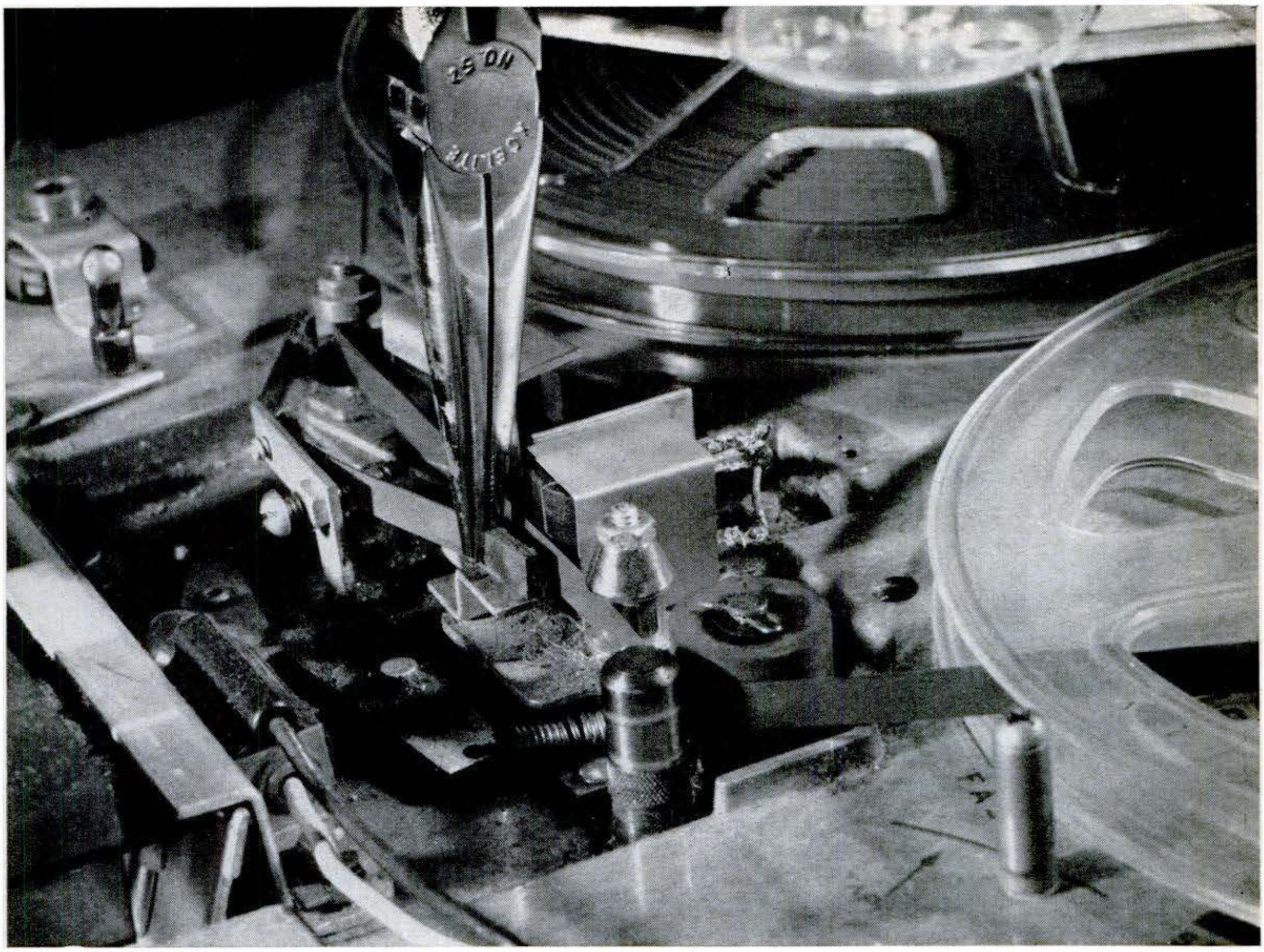

CHECK THE PRESSURE PAD. It must hold the tape in intimate contact with the head. If the pad is not perfectly parallel to the head, both vertically and horizontally, use pliers to twist or bend the spring until the pad applies uniform pressure over its entire area. Turn the adjusting screw for just enough pressure to assure solid contact of the tape against the head.

Eccentric capstan or poor drive. The rugged construction of most modern recorders makes eccentricity of the capstan almost impossible. If it should occur, put in a new capstan and shaft assembly. Poor drive is generally due to gummy lubricant or a worn belt. To clear up this cause of wow, clean out the gummy oil and relubricate, or replace the belt.

Misadjusted or worn pressure pads. To keep the tape in contact with the head, these pads must be nicely adjusted. They can push at a wrong angle, too lightly, or too hard. Try adding a little push in various directions when a tape is playing. If the change improves performance, adjust the springs that provide pressure. You may have to adjust a screw, bend the spring to change the "set," or both.

Electrical problems. This covers the remaining headings on the chart. If you get crackling noises or intermittent distortion, look for a bad contact. This may be in the connecting plugs to heads or loudspeaker, in one of the tube sockets, or in the function switch. Clean any poor contacts and reset them to give good contact pressure.

Defects in tubes and other electronic parts often can be spotted by the simple circuit-tracing methods used for radio and hi-fi trouble-shooting. If this fails, call in an expert.

Test tapes. The most satisfactory way of checking out the performance of your recorder is to use a test tape similar to test discs made for record players. Buy one of these tapes or make your own by transcribing a test disc. Your homemade one, however, will only check your equipment for playing back a recording *it* made. It will not enable you to judge the true playing quality of a prerecorded tape made on another machine. END

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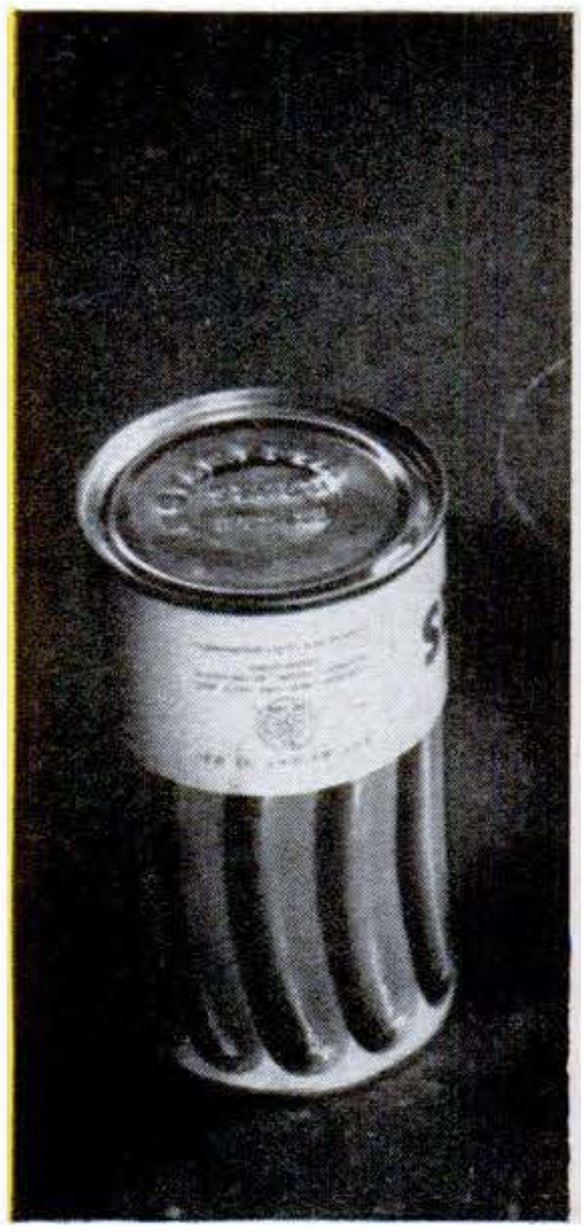
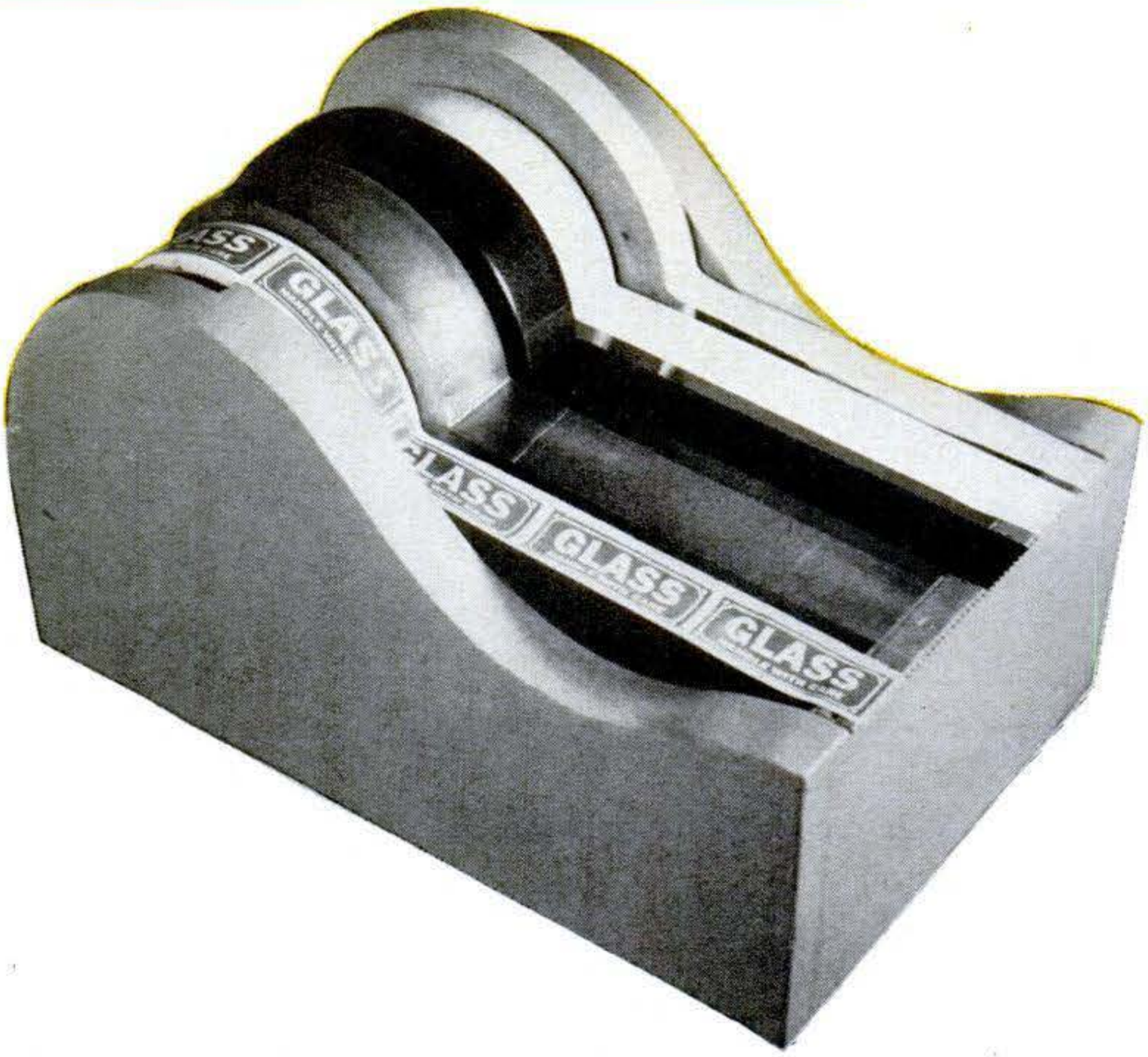
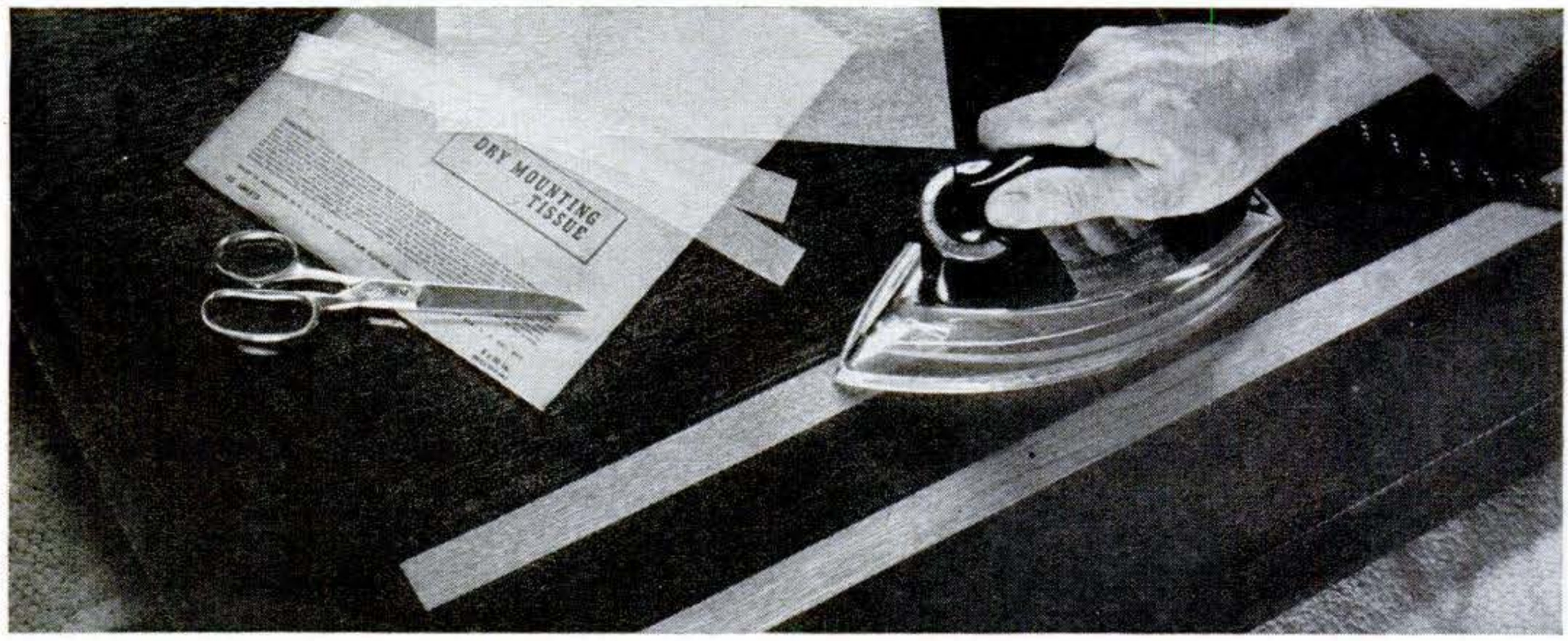
Short Cuts and Tips

FROM PS READERS







You Can Dry-Mount Veneer

WITH photographic dry-mounting tissue (it uses a thermo-setting shellac) you can bond veneer trim to a flat surface. It doesn't matter if the surface is painted or varnished—the tissue won't run.

Cut tissue into exact-width strips and "tack" these lightly to the veneer's reverse side with the tip of an iron at medium heat ("wool" setting). Then iron the strips on completely, still using medium heat. It takes about five seconds.

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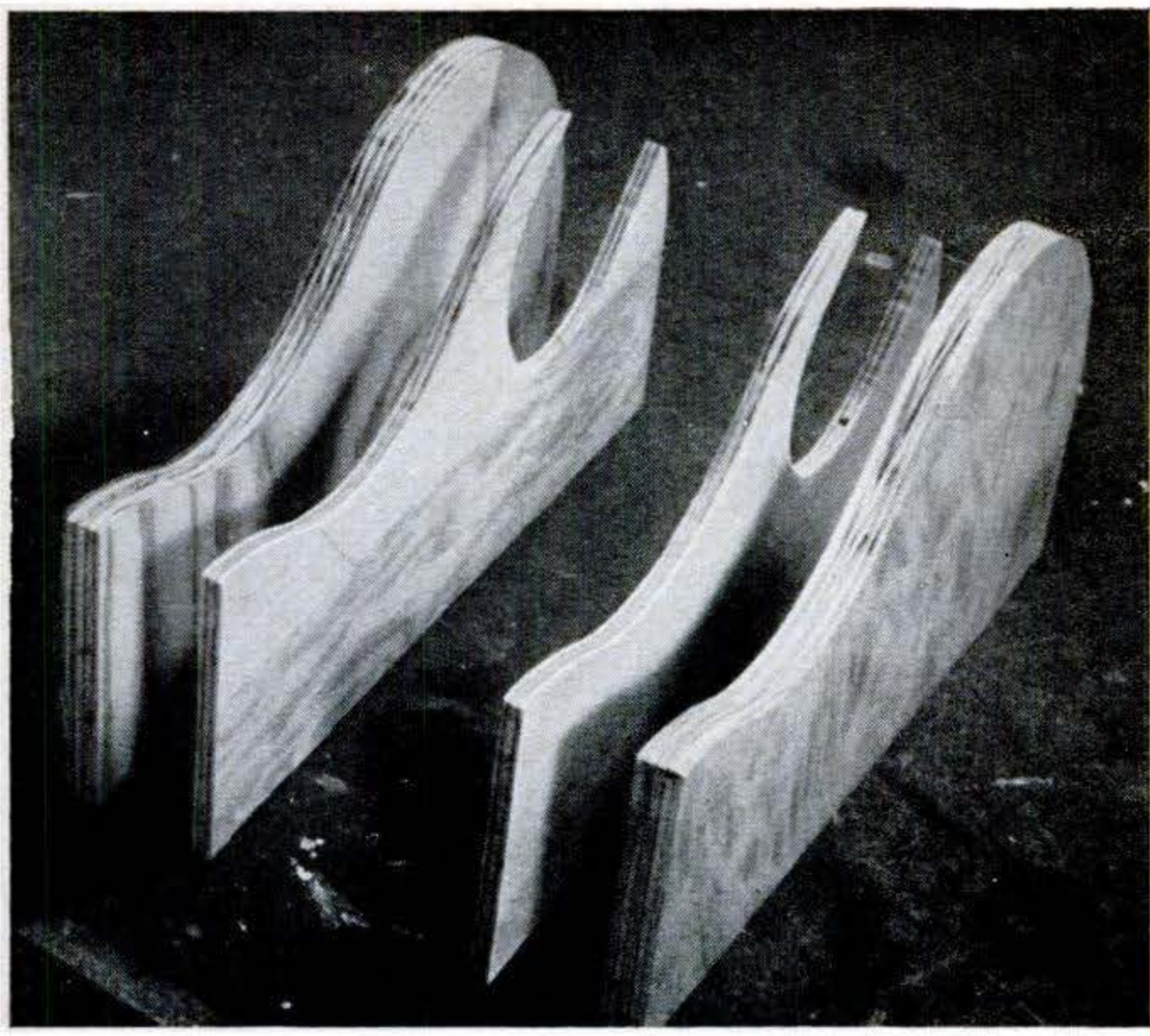
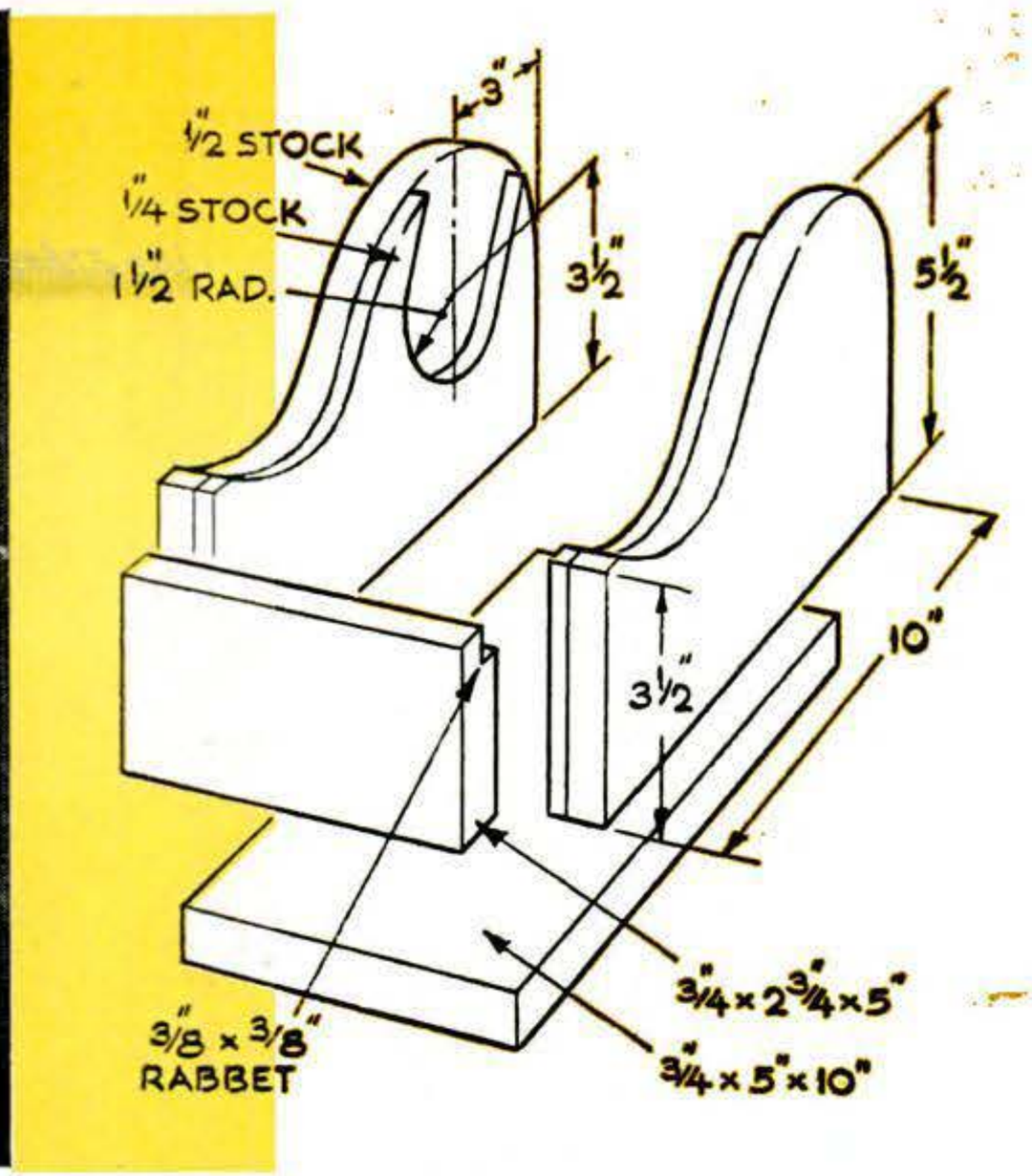




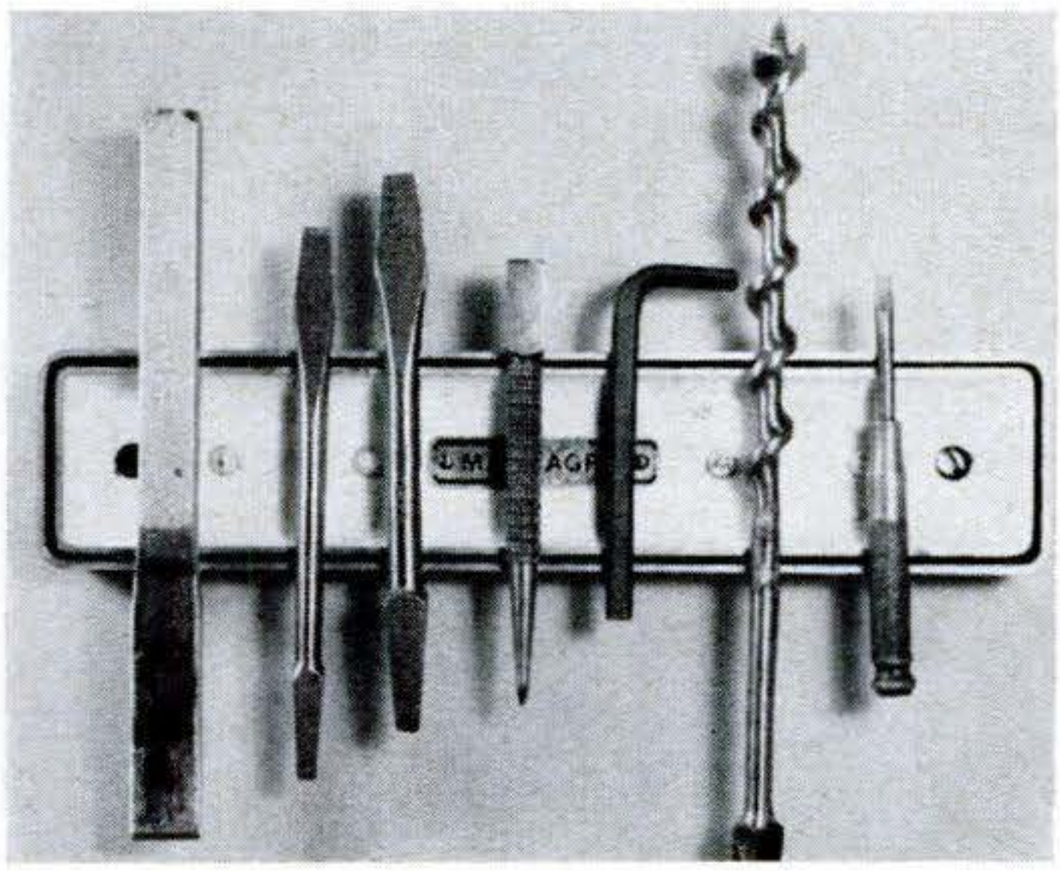
This Dispenser Keeps Assorted Rolls of Tape in One Place

AN ENTIRE family's tape needs can be served with this dispenser that holds a half-dozen assorted rolls.

Make the sides from paired layers of plywood: two outer sides ½″ thick, two inner layers ¼″ thick. Stack the four pieces and cut them all at once. Then lightly nail the ¼″ pieces together and cut the recess for the hub. Glue and nail the recessed pieces *inside* the ½″ pieces to complete the two sides. Glue and nail the bottom and front pieces between the sides. Finish by sanding all joints flush and smooth, then paint.

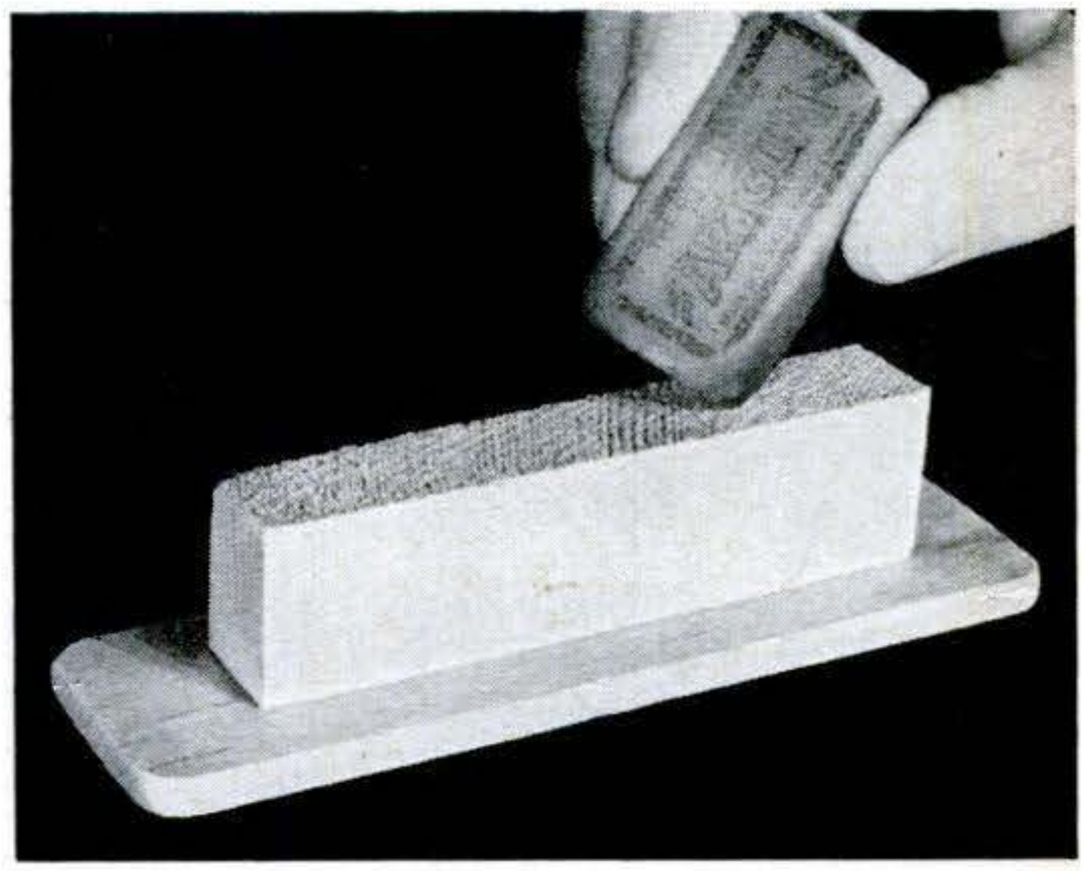
Salvage the sawtooth tearing edge from a roll of waxed paper and nail it across the front of the dispenser.

Tape spools have a standard inside diameter of 3″, so obtain a can 2⅞″ in diameter and 5½″ high (this is a common size found in food stores) and use it as the hub. Leave the original contents in the can to add weight to the dispenser.—*William C. Eymann, Palo Alto, Cal.*



Magnetic Small-Tool Holder

A MAGNETIC knife holder works just as well on the shop wall as in the kitchen. You can stick small pieces of hardware to it that would otherwise get misplaced. —*Jerry Parker, Sonoma, Cal.*



Clean Eraser on Rough Wood

AN ART-GUM eraser is quickly rubbed clean on the rough end grain of a board. To a base of ¼″ scrap wood I nailed a 1″ strip of one-by-four, end grain up.—*Bil Toman, Palatine, Ill.*

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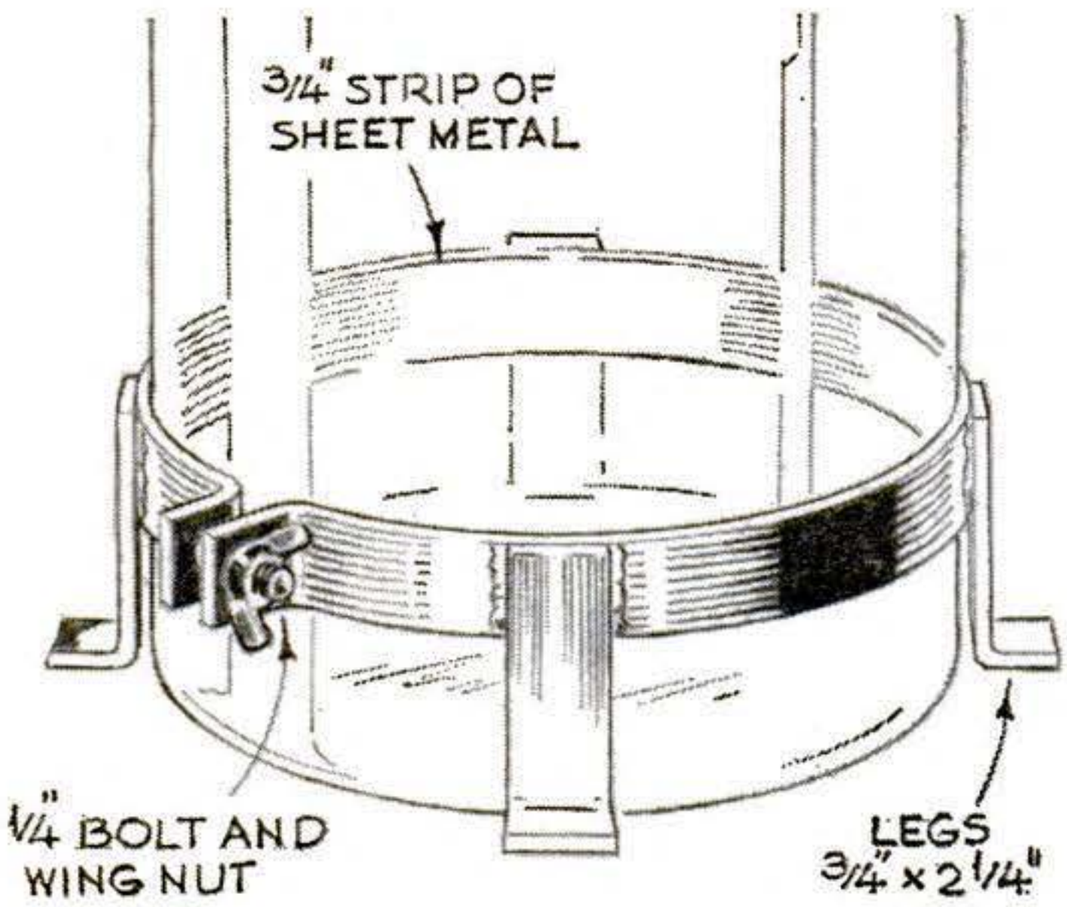
Short Cuts and Tips

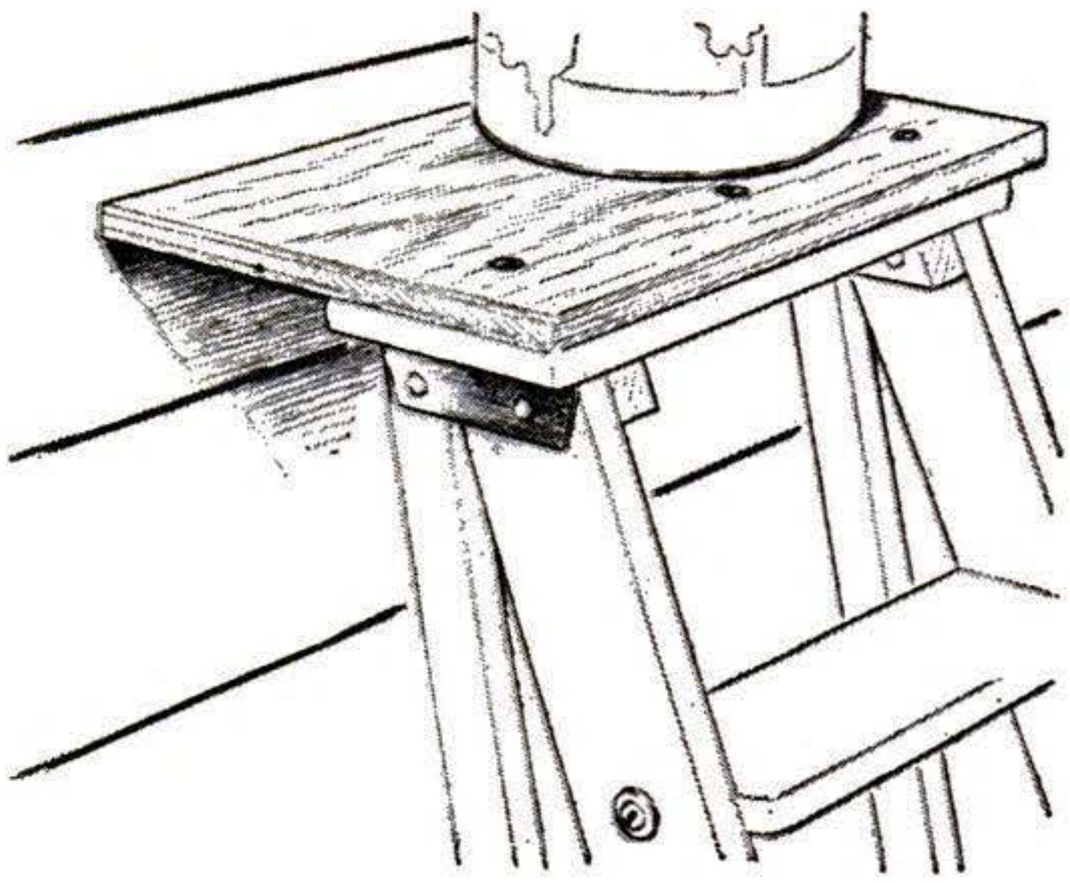
Don't Startle Man at Work in His Shop

WHEN you visit a friend in his shop and find him bending over a power tool, wait at the door until he finishes and turns the power off. Because tool noise prevents him from hearing you, he might otherwise be startled into putting his hands in the machinery he is operating.—*R. J. DeCristoforo, Los Altos Hills, Cal.*

▶▶▶I LAID a sheet of composition board on the floor in front of my workbench. It keeps my feet off the unyielding concrete and makes working in the basement for long periods a lot more pleasant.—*John Mihalick, E. Liverpool, Ohio.*

▶▶▶Before storing lengths of pipe out of doors for any length of time, I rub heavy grease on the threaded ends. This coating prevents rust and keeps the pipe in condition for immediate use.—*James Michaelson, Cincinnati, Ohio.*





My Shop Jars Can't Tip Over

JARS make handy containers for glue, paint and other shop items, but they're easily knocked over by accident. Each of my jars is fitted with a non-tip base, cut and bent from scrap sheet metal. Legs are butted against the band that encloses the bottle and soldered in place. A bolt and wing nut tighten the band around the bottle to hold it securely on the base.—*George Glavosek, Painesville, Ohio.*

A Tip About Ladder Tops

MY STEPLADDER is more useful since I bolted a larger work platform on top. The platform is 3/4" plywood, 5" wider than the width of the original top. The protruding platform keeps the ladder farther away from the building against which it is leaning, giving me better balance for high work. There's also more space for tools, paint and other work supplies.—*John S. Minnick, Lockport, N. Y.*

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How to plan? Decide where to go. Talk to your Texaco Dealer. He will obtain a free Texaco Tour Kit for you with the best routes for *your* trip marked on up-to-the-minute maps. With it you get an illustrated 32-page booklet, "Have Fun," packed with expert advice on planning and traveling.

No one should travel without a new Texaco "Speed-Charge" credit card that saves carrying extra cash for car needs—it's fast, convenient. See your nearby Texaco Dealer for an application. Let him put your car in top travel condition. And, on the road, "you're welcome" at Texaco Registered Rest Rooms, where you see the green and white sign.

3-Way Transmission Protection

Did you ever realize that automatic transmission fluid has to do, not one, but *three* difficult jobs. 1. *It lubricates the transmission.* 2. *It transmits power.* 3. *It actuates the controls.* That's why you should use only Texaco *Texamatic Fluid,* the one that has been *most widely used for original filling.* See your Texaco Dealer—*the best friend your car has ever had.*

THE TEXAS COMPANY

TEXACO DEALERS
IN ALL 48 STATES

Texaco Products are also distributed in Canada, Latin America, and Africa

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Why your 35mm camera should be a new Kodak Retina Reflex

Beautiful new Kodak precision miniature gives you professional full-area ground-glass focusing . . . plus clear split-image rangefinder . . . built-in exposure meter . . . fast-action film wind . . . fully automatic diaphragm action . . . lens interchange . . . and a complete accessory system. It's built to do anything you ask—with no errors, no failures.

This distinguished new member of the world-famous Kodak Retina family immediately identifies its owner as a truly discriminating photographer.

Under all picture-taking conditions, you see exactly the picture the lens "sees." You view and focus at eye level on the super-fine ground-glass . . . see your picture bright, upright, about natural size, and clear to every corner.

When you prefer, you use the split-image rangefinder. Either way, you always view the picture at the maximum lens opening—for utmost brilliance—because the diaphragm is automatic for all lenses.

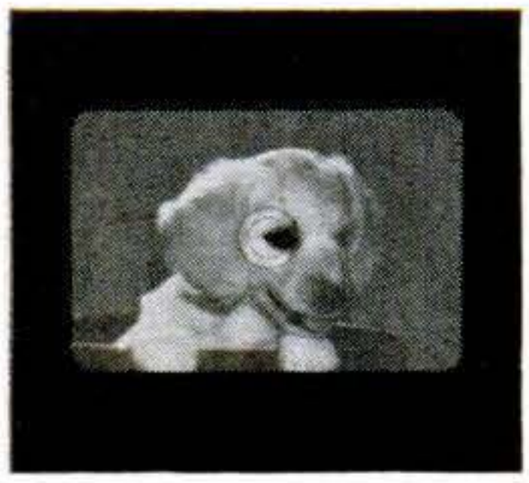
The ultra-fast *f*/2 lens is a coated 50mm Retina Xenon-C. Its six elements give you an extra edge in sharpness and color correction.

No extra viewing or focusing device is needed—at any distance—with wide-angle, telephoto, or close-up units. No danger of cutting off part of a subject—because your viewing is free of parallax error, even in extreme closeups.

The built-in exposure meter measures the light for correct exposure. It's ultra-sensitive, reads both reflected and incident light on a single scale, in full and half EVS numbers.

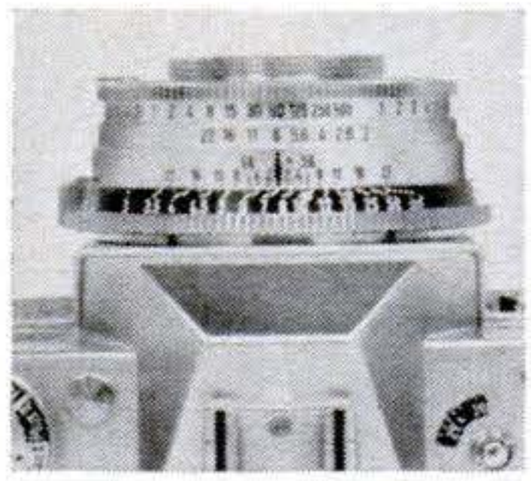
And lens aperture and shutter speeds are EVS-linked—so you can switch at will without recomputing exposure.

Ask your photo dealer to demonstrate this brilliant new Kodak Retina Reflex Camera. $215, or $22 down.

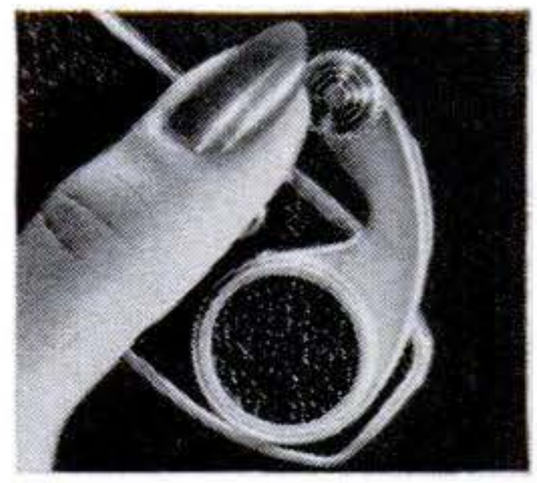


View and focus through the lens—your picture is sharp and clear—corner to corner—on the extra-fine ground glass. Rangefinder in center.

Built-in light meter shows full and intermediate EVS numbers for film speeds from 5 to 1300 ASA. Mask for incident light is included.



Simplified exposure system. Lets you vary lens-shutter combinations without changing exposure. Lens and shutter scales read from top.



Single-stroke lever advances film, sets shutter, opens lens to *f*/2 for focusing. Shutter speeds—1 second to 1/500, B, and self-timer.

(Prices are list, include any Federal Tax, are subject to change without notice)

EASTMAN KODAK COMPANY

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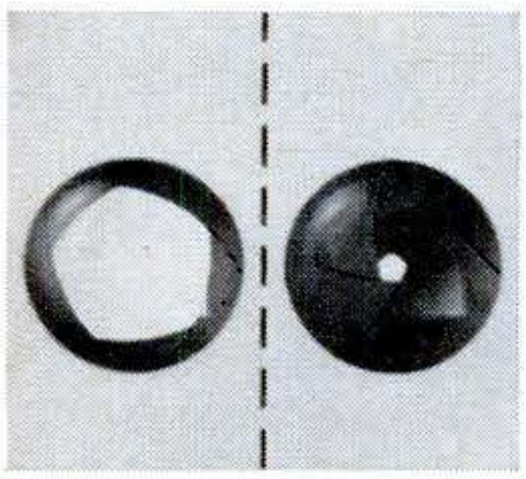
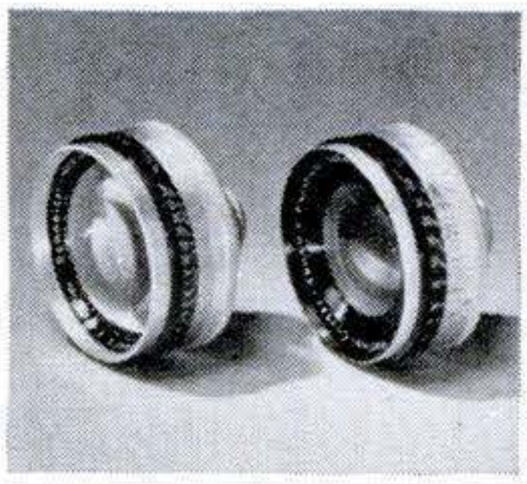
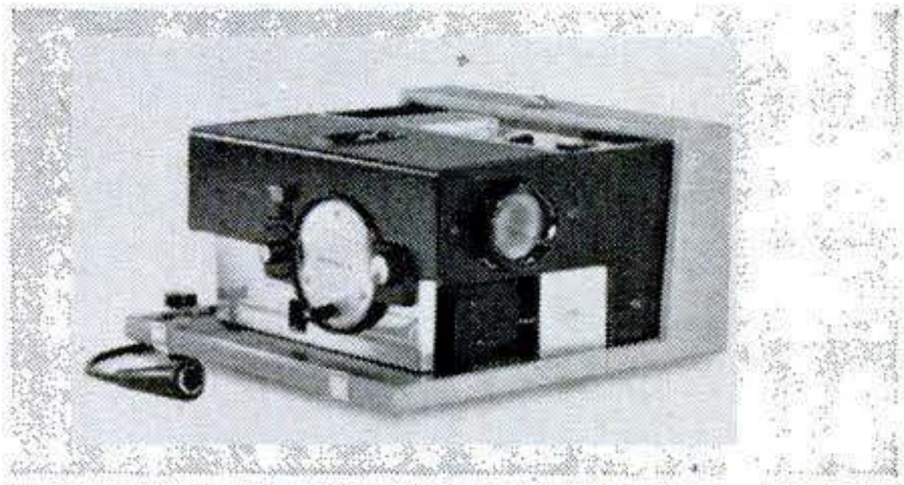
With supplementary "R" lenses, you take shots this close—and no framing errors!



Fully automatic diaphragm—closes down to your pre-selected aperture an instant before exposure. Works with *all* supplementary lenses.



Interchangeable lens components are wide-angle 35mm Curtar, *f*/4 $77.50; telephoto 80mm Longar, *f*/4 $80. Many other Retina photo aids.



New Automatic Kodak Cavalcade Projector changes slides itself! Slides stay in constant focus. Projects at 300 *and* 500 watts. Three ways for semi-automatic change. Kodak Cavalcade projector, $149.50 or $14.95 down.

Kodak
TRADE MARK

Rochester 4, N. Y.

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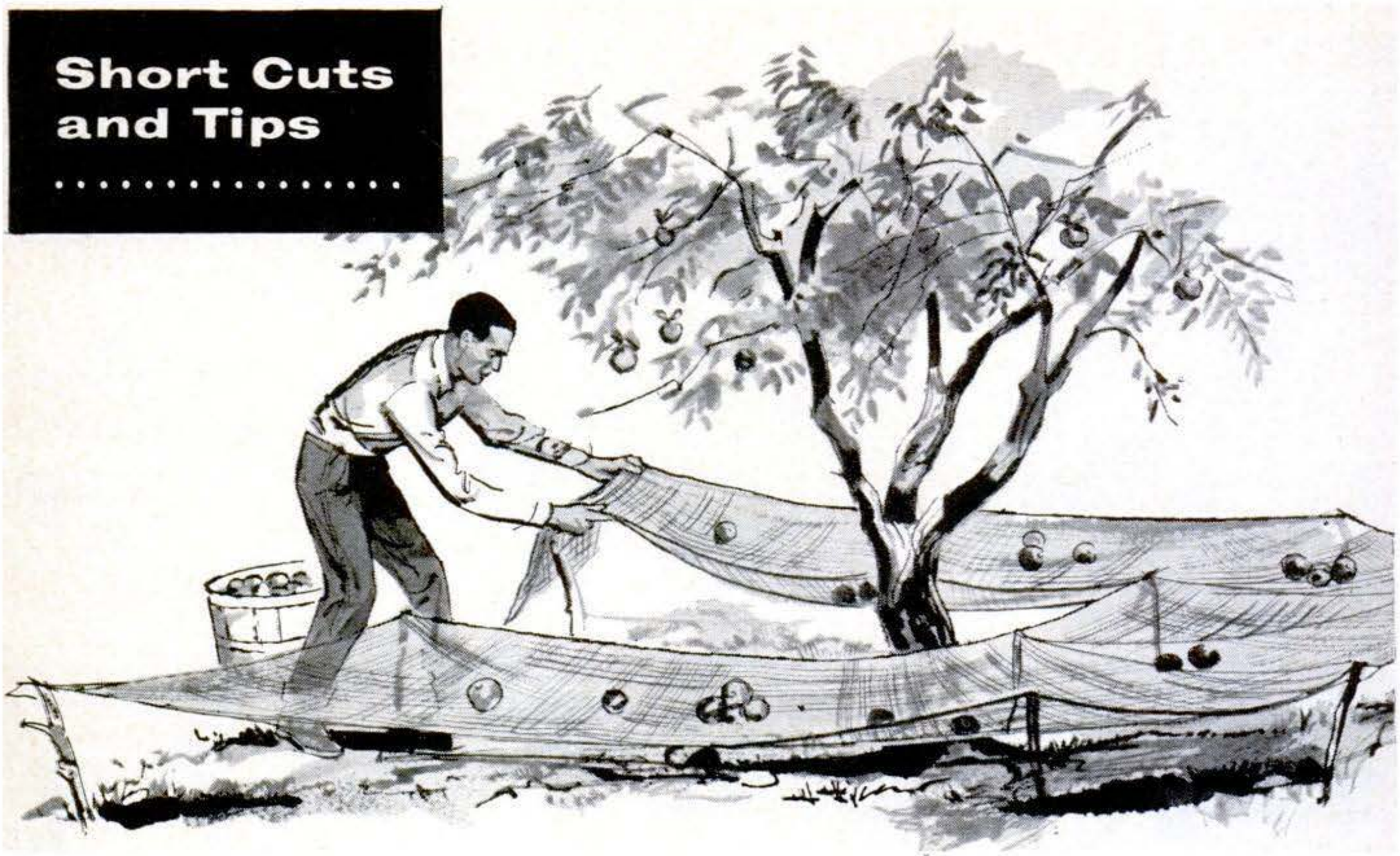
Short Cuts and Tips



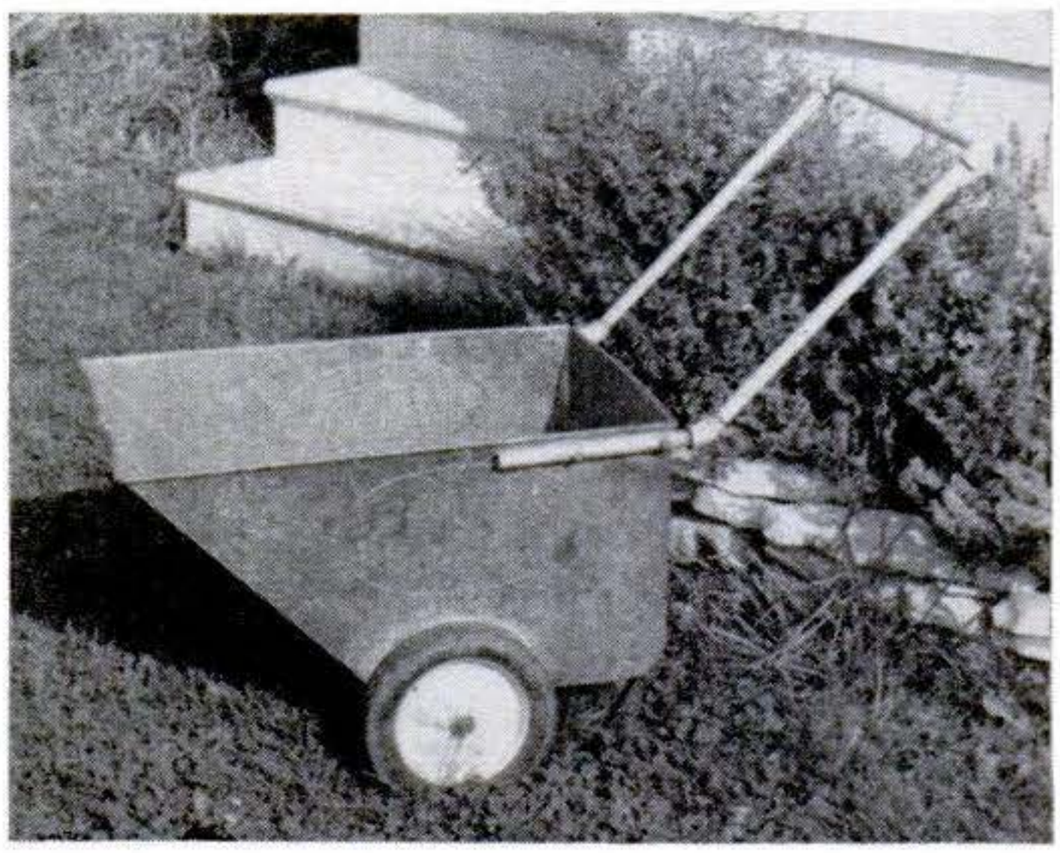
Apple Net Saves Him Work

MY NEIGHBOR got fed up with picking or raking apples from the ground under a tree in his back yard. So he bought a big fish net and suspended it on stakes under the tree. Now he simply loosens the net and carries the apples away all at once. —*Thomas Summers, St. Paul, Minn.*

Hang Up Your Electric Iron

WHEN I've finished using my electric iron I hang it on an out-of-the-way hook to cool safely. The heavy clothesline hook is screwed into the back of a basement stair tread right near my ironing board. —*Mrs. Harry Nelson, Nutley N. J.*

▶▶▶IT'S a good idea to vacuum the interior of a camera case occasionally. The dirt and dust that collect there may be harmful to the camera lens and mechanism.—*Robert J. Carpenter, Boston.*



New Handle for Garden Cart

YOU can use iron pipe and fittings to make a new handle for a garden cart. Use ½″ or ¾″ pipe and two 90-degree and two 45-degree elbows. Fasten to the cart with bolts through holes drilled in the pipe.—*A. Sturgess, Catskill, N. Y.*

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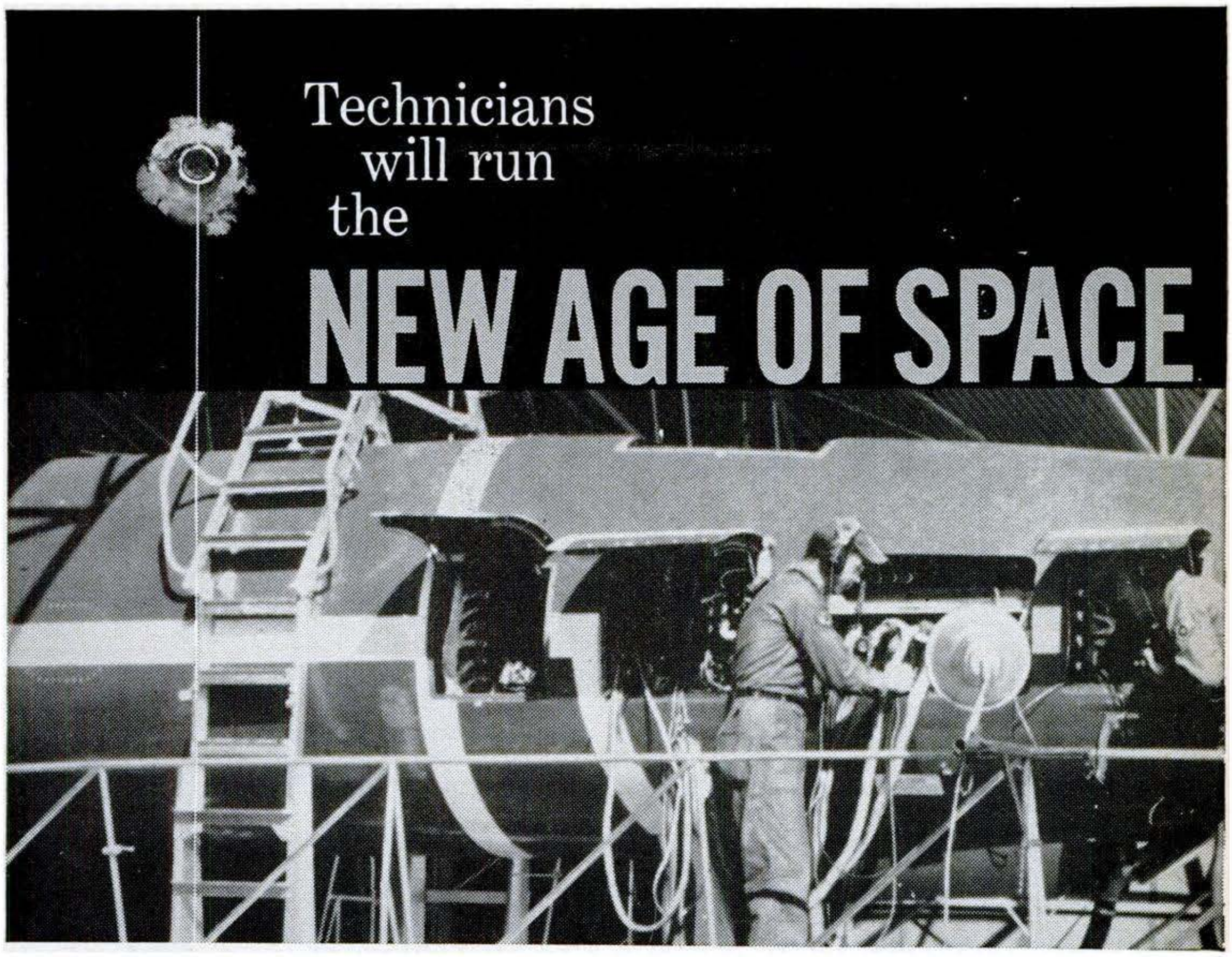

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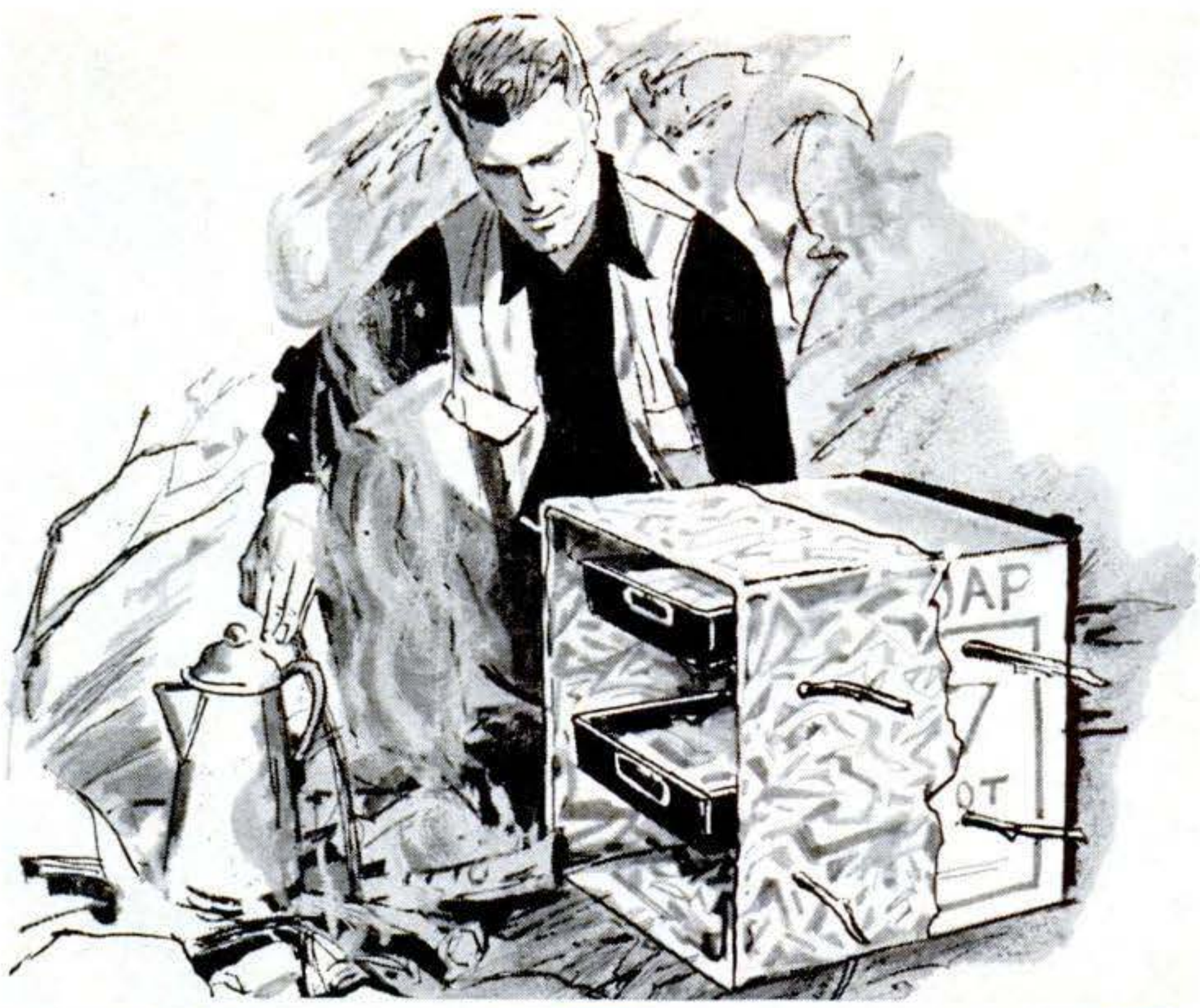
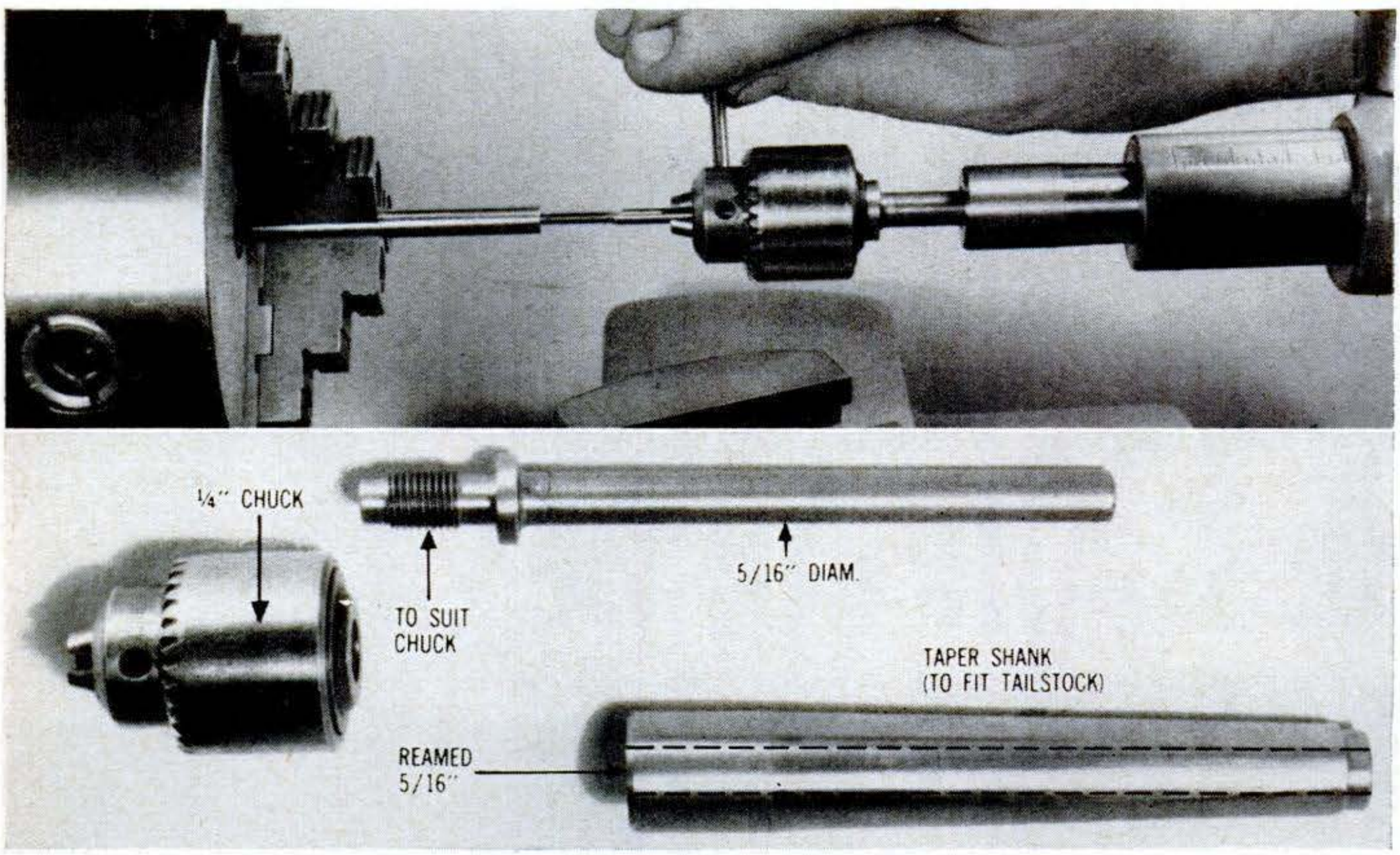
Short Cuts and Tips

Improvising a Reflector Oven

WHEN a larger-than-normal reflector oven is desired for some campfire cooking, you can improvise one by lining a big cardboard box with aluminum foil. Green limbs can be poked through the sides of the box to form a shelf on which to place baking tins. —*J. Knowles, Ogden, Utah.*





Tailstock Device for Minimizing Tap Breakage in a Lathe

FINE internal threading can be done in a lathe without fear of breaking taps with this sensitive tailstock tap holder. Tapping can be done under power or by hand when using delicate taps

Turn a taper shank to fit the tailstock. Drill and ream a 5/16" hole in its center. Turn a chuck spindle as shown from ½" steel rod and thread one end to fit a ¼" chuck. Turn the straight shank of the spindle to a snug, smooth-sliding fit in the hole in the taper shank.

When using the holder under power, grip the chuck or hold a pin in the key hole and feed it into work rotating in the headstock. If the tap should bind, release the chuck and allow it to rotate until the lathe is stopped.

Once it has been started, the tap will advance into the work in proportion to its own lead, without the danger of overfeeding or underfeeding as when following a thread's lead with the tailstock spindle.—*H. J. Gerber, Stillwater, Okla.*

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For clean oil all the time call for

HASTINGS

Only Hastings Oil Filter Cartridges keep oil clean *all the time*, because only Hastings has Densite filtering material.

Densite is different! Millions of selected cotton fibres—pressure packed—trap even the most microscopic dirt particles. Only Densite keeps oil clean from filter change to filter change, when replaced as normally recommended.*

Next filter change, call for Hastings—for clean oil *all the time!* Hastings Manufacturing Co., Hastings, Mich. Also makers of Piston Rings, Casite, Wear Reducer, Spark Plugs.

**Proved by tests conducted in accordance with U.S. Bureau of Standards procedures.*

U. S. Patent Nos.
2,797,811
2,584,771

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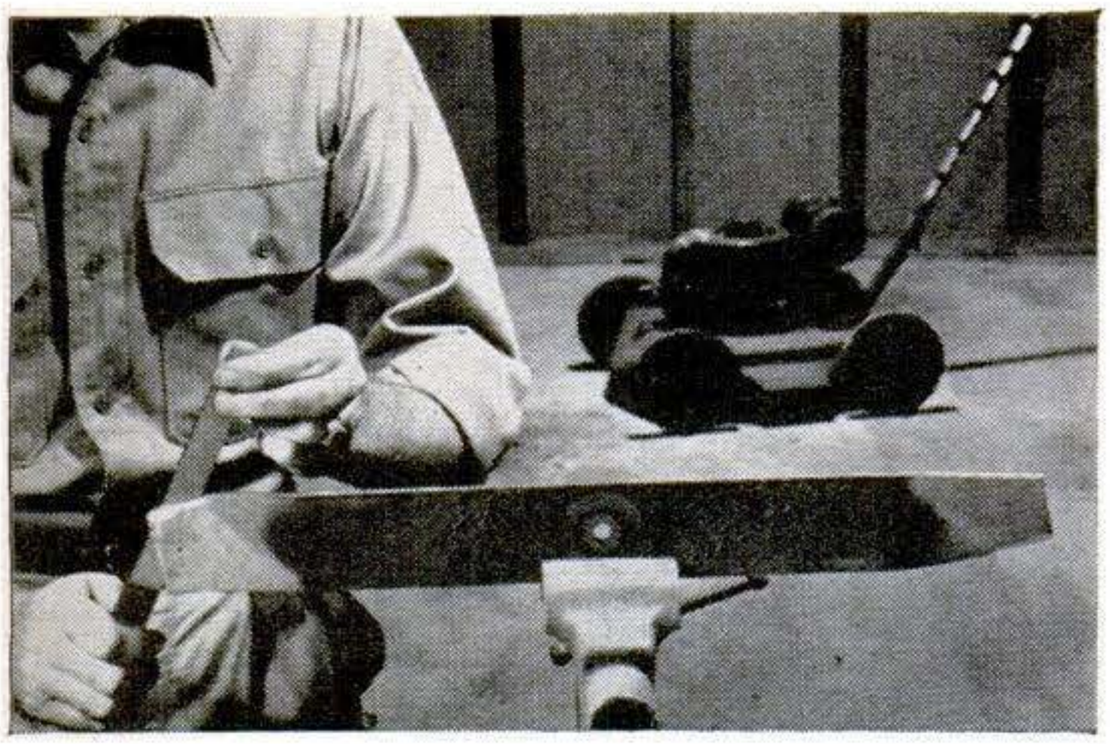

TIME: *now*

PLACE: *your shop*

ACTION: *smart craftsman sharpening your own rotary mower blade*

Why pay someone else to sharpen your rotary lawn mower blade when you can do a professional job yourself — with the Nicholson or Black Diamond Rotary Mower file?

It's the first tool ever designed specifically for the job. Best news of all: it costs only 98¢, and literally pays for itself the very first time you use it.

The Nicholson or Black Diamond Rotary Mower file comes with a handy hang-up hole for easy storage in your shop or garage. Every file comes with its own protective plastic sheath.

*

Look for your file in its colorful display rack. It's at your hardware dealer's ***now.***

*

NICHOLSON U.S.A. **NICHOLSON FILE COMPANY** BLACK DIAMOND U.S.A.

Providence 1, R. I.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

Why They Drive That Way

[*Continued from page 87*]

knowingly tailgates a patrol car. We were doing 55 m.p.h. when Bill Morris looked back. Planted on our rear bumper was a young fellow in a rebuilt Mercury.

For two miles he clung there. He was surprised when Burchette stopped him and he saw the uniform.

"Well, I got a ticket for speeding 10 miles back and I was afraid to go above 55 to pass you," he said. "I thought a patrol car might see me."

"So you were 'pushing' us just a little, trying to hurry us?" I asked.

He grinned slightly. "It could be," he said. This lad evidently felt he could safely go 60 if he stayed in line behind another car going 60.

Interviewing other tailgaters, and talking with other troopers on the road that day, we found these further cases:

- A truck driver, arrested by another trooper for "pushing" dangerously close behind a woman's car, said he was trying to speed her up so he could make the next hill in high.
- A businessman said the car he was tailgating had passed him and then slowed down. "Made me so mad I decided just to keep my speed (57 m.p.h.) and force him to go faster," he said.
- Two teen-agers were trying to hurry a car containing a mother and two tots.
- Two college boys were talking about an exam and claimed they weren't aware they were driving too close.

One fellow we'd wanted to meet was the character who suddenly cuts in from a side road onto a fast highway. Not until the last night did we have our chance. We were doing 55 on Route 70.

Suddenly a blue Buick shot out, swerved into our lane a stone's throw ahead. Burchette slammed on his brakes. He avoided the collision, whipped on his siren and shot Car 229 forward. A minute later we stopped the other car. The driver jumped out and came to meet us. It was a young father with his family.

"Okay, I was wrong," he said. "Sometimes I think I'm crazy."

Nobody argued with him.

Burchette wasn't missing anything on the road. One night we concentrated on drivers who annoy you by shining their high beams in your back window. Again

[*Continued on page 198*]

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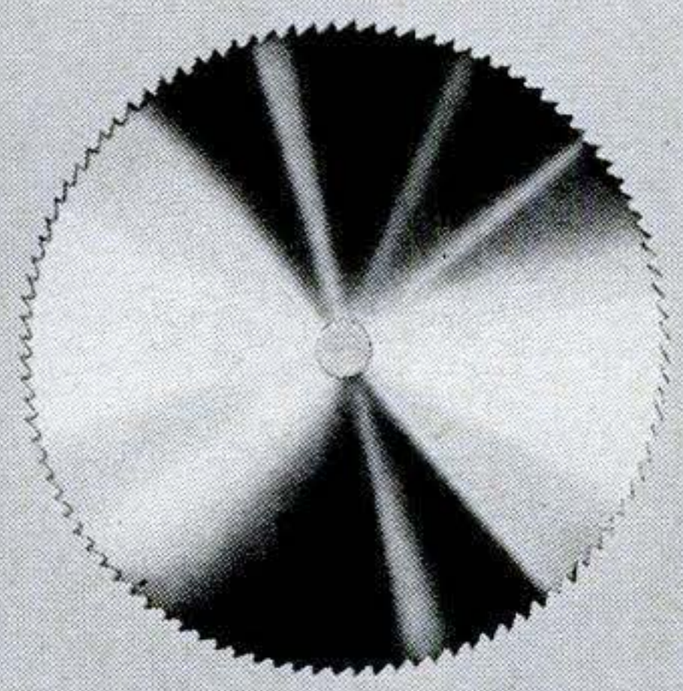
BRIGHT NEWS for Saw Users



DISSTON blades fit ALL popular makes of portable and bench machines

DISSTON ANNOUNCES THE NEW

DISSCHROME CIRCULAR SAW BLADES

...chrome plated for longer service...faster, easier sawing

Here's the brightest new look in circular saw blades for portable and bench saws. The finest Disston craftsmanship combines with gleaming, durable chrome to make these circular blades the best at any price.

Chrome plating does this for you:

- Increases edge-holding qualities of saw teeth ...a quality for which Disston saws are already famous.
- Reduces friction and heat, thus prolonging saw life.
- Resists rust.
- Resists accumulation of gum and pitch on side of blade.
- Saves you money and effort.

LONG-SERVICE DISSCHROME Circular Saw Blades are individually hardened and tempered to hold their edge. Each tooth is carefully sharpened for fast, clean, power-saving cutting.

HANDY DISSCHROME Circular Saw Blades fit *all* popular makes of portable and bench saws. Blade sizes up to 12". A full selection of tooth types.

For full information write to
Disston Division,
H. K. Porter Company, Inc.,
46 Tacony, Philadelphia 35, Pa.

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H. K. PORTER COMPANY, INC.
DISSTON DIVISION

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SEARS CUTS PRICES ON

CRAFTSMAN ⅓ HP SABRE SAW is 7 saws in 1—jig, scroll, crosscut, rip, keyhole, coping and small band saw. Cuts 2½" depth. Makes blind cuts without pre-drilling. Convenient top handle. All ball and needle bearing design. Full line of accessories. With 3 blades, 10-foot, 3-wire safety cord, plug adapter, wrench and wrench holder, only 41.95!

CRAFTSMAN SANDER-POLISHER for heavy duty finish-sanding, buffing, polishing, many other handyman jobs. Weighs only 5 lbs. Perfectly balanced for vertical, overhead work. Convenient top handle switch for one-hand use. 25-square-inch sanding area. UL listed (Industrial standards). Complete with sandpaper and polishing pad, only 26.95!

27.95! Was 32.95. CRAFTSMAN Sabre Saw weighs only 4½ lbs., cuts dressed 2 x 4 with sturdy, ⅓-HP motor. Base tilts for angular cuts. Top handle with convenient switch. With 3 blades, safety cord, plug adapter, wrench, only **27.95**

Was 14.95—Cut ⅓! Economy Sander-Polisher is small, compact and lightweight. Works with or against the grain on finish sanding, waxing and polishing. Reciprocating motor never needs oiling. This handy tool UL listed, only **9.99**

HANDYMAN JOBS GO FASTER, EASIER, WITH THESE PLUS POWER TOOLS!

...as Sears everyday low prices go still lower...Just in time for Father's Day!

10% DOWN buys any tool on this page on Sears Easy Payment Plan (purchases of $20 or more). On purchases from $50 to $200, $5 down buys any combination.

If any CRAFTSMAN power tool shows defects in materials or workmanship, Sears will repair or replace it absolutely free of charge if returned within 1 year of purchase date. The same guarantee applies to economy line of tools if returned within 90 days of purchase date.

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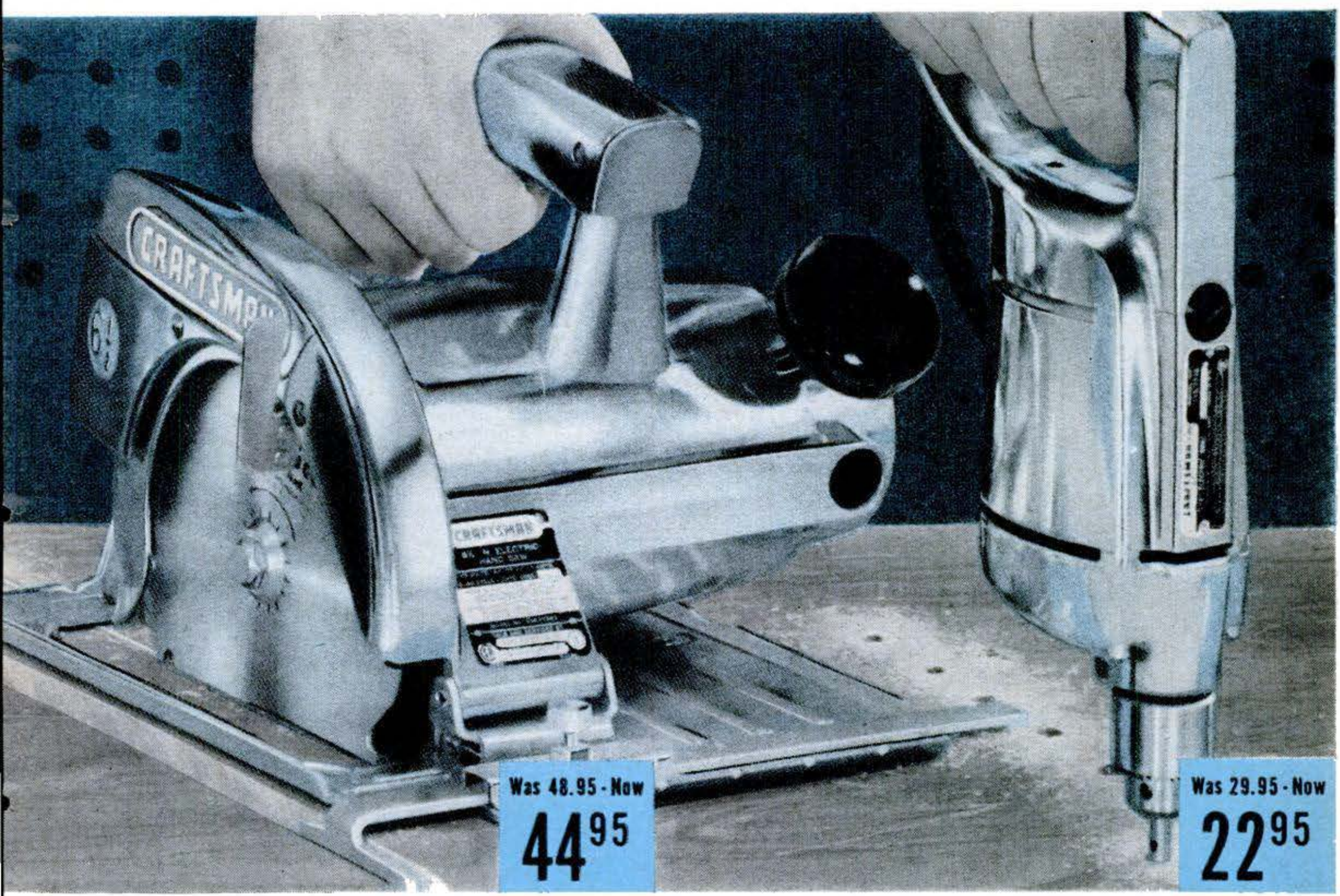
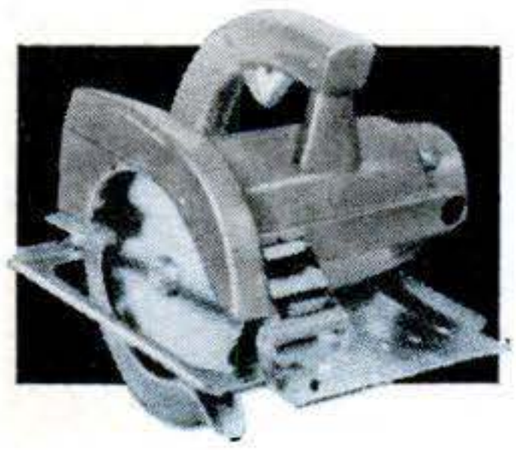
ALL ELECTRIC HAND TOOLS



© 1958, SEARS, ROEBUCK AND CO.

CRAFTSMAN 6½" HAND SAW makes home carpentry, repair jobs easy. Plus-Power motor develops 1¾-HP for faster, smoother cutting. Saw cuts 2x4 at 45°. Blower clears sawdust ahead of cut. Safety slip-clutch protects motor from overloads. Tilt and depth controls. With 6½" Kromedge chisel-tooth combination blade. 44.95!

CRAFTSMAN ¼" ELECTRIC DRILL can be adapted for sawing, grinding, mixing, sanding—even hedge trimming! Geared key chuck; ball and needle bearing construction. ⅕-HP motor gives you enough power for any accessory. Lightweight, polished aluminum housing. Saw grip or pistol grip, 3-wire safety cord and adapter, only 22.95!



Only 34.95! Sears Economy 6½" Electric Hand Saw will cut through a 2 x 4 at 45°. Motor develops 1¾-HP. Safety clutch. Precision bronze bearings. With chisel-tooth combination blade, safety cord, plug, adapter, wrench, only **34.95**

Only 9.99! Sears Economy ¼" Electric Drill is just the tool for light-duty home workshop use. Strong, lightweight aluminum housing. ⅛-HP, universal motor. With 6' cord, locking trigger switch and pistol grip, an unusual value at **9.99**

FREE! SEARS POWER TOOL CATALOG
52-page book illustrates and describes 126 power tools, 512 accessories. Complete specifications and prices. Invaluable for workshop reference. Get your free copy at your nearest Sears store.

You'll enjoy shopping at Sears Stores and Sears Catalog Sales Offices. It's convenient to shop from the Sears Catalog in your home, too, by mail or phone. Sears employes, you know, are the largest owners of the Sears business. They'll do their best to serve you well.

SEARS, ROEBUCK AND CO.—
In Canada at Simpsons-Sears, Ltd. at slightly higher prices

SEARS
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SATISFACTION GUARANTEED OR YOUR MONEY BACK

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[Continued from page 194]

we found drivers who were not deliberately being rude, but who were talking or daydreaming. And we found ignorance.

"Why I never knew that bothered anybody," a woman said.

And Burchette gave us another slant.

"When I want a car behind me to dim its light," he said, "I flick mine. If it's a man, he usually understands. But women don't get it at all. I guess nobody's ever told 'em!"

We climbed out of Car 229 for the last time and thanked Burchette. We'd had a chance to X-ray a lot of drivers' minds.

And we came to these conclusions:

- Contrary to popular belief, few drivers are knowingly rude to you.
- But we found evidence that an appalling amount of ignorance rides the highways. Our schools and safety experts still have a long way to go to teach drivers safety and courtesy. Any one of the drivers we interviewed could have caused an accident. Yet nine-tenths of them honestly didn't know it! They'd never been taught.

Teaching will take time. But meanwhile, we wondered, couldn't it begin on the roads, with educational signs? These might help:

"Dim your lights for other cars!"

"Dim lights when following a car."

"Unlawful to drive too slow and obstruct other cars."

"Don't drive close to the car ahead."

"After passing another car, don't slow down. Keep moving!"

"If you're sick, don't drive."

Such signs might have tremendous impact—on sick, sleepy or dreamy drivers—and maybe even on drunks. END

Expecting a Check?

You'll get it quicker if you gave your postal-delivery zone number with your address.

The Post Office has divided 106 cities into postal-delivery zones to speed mail delivery. Be sure to include zone number when writing to these cities; be sure to include your zone number in your return address—after the city, before the state.

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Test Turbo-Thrust Chevrolet scats up a punishing grade, two miles high in the Chilean Andes.

Even the Andes aren't high enough to make this V8 breathe hard! CHEVY TURBO-THRUST!

Tackle the toughest roller coaster of a road you can find—one that scrambles to a dizzy 12,572 feet—and even then you won't take the real measure of Chevy's new Turbo-Thrust V8!* We proved that on the fantastic General San Martin Highway over the South American Andes, on gravel grades that ran up to 30 percent out of hairpin turns, in air so thin drivers gasped for oxygen. The tremendous torque of Turbo-Thrust's 348 cubic inches made every foot of the climb seem incredibly easy; its radical combustion-chamber-in-block metered out flawless performance from sea level to 2 miles in the sky! The Turbo-Thrust ran ocean to ocean and back in 41 hours 14 minutes—and the ignition key was never turned off, the hood was sealed shut! It's the greatest engine going in the low-price field today—and you can prove that right in your hometown traffic! Sample it and see for yourself! . . .

Chevrolet Division of General Motors, Detroit 2, Michigan. *Optional at extra cost.

CHEVROLET

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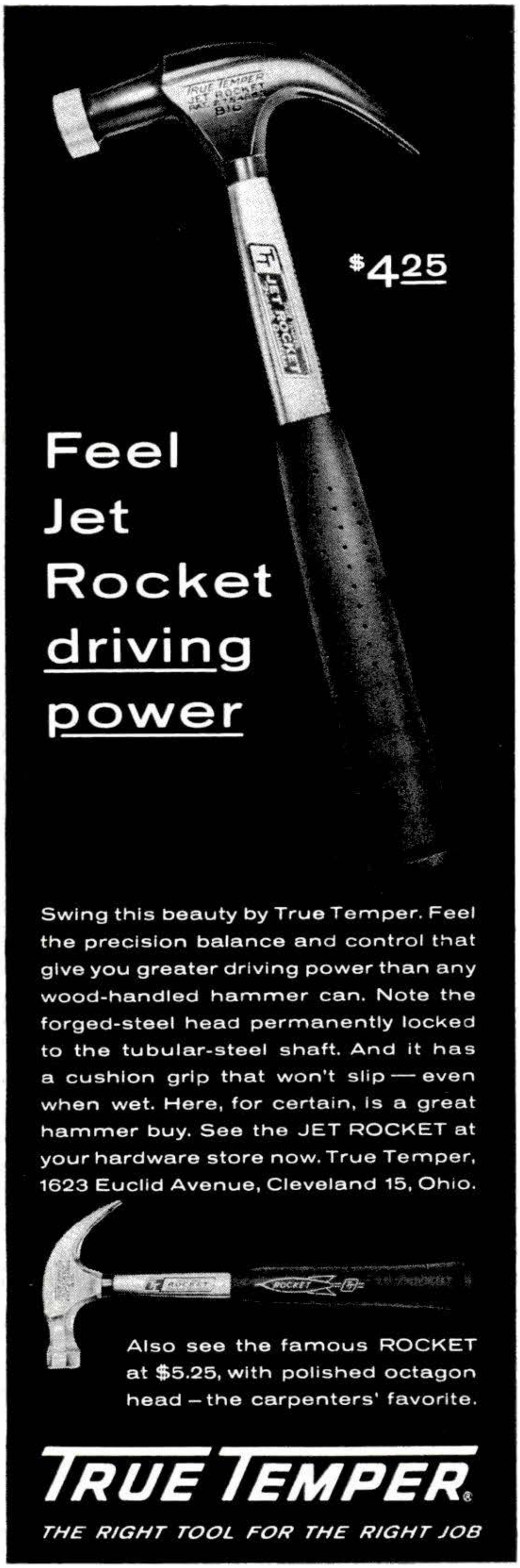


How Your Mind Works

[Continued from page 91]

spelling, other subjects, and could tap out correct answers to questions with his hoofs. After many scientific investigations, Hans was found to be clever in only one respect: He had learned to watch for small, almost invisible movements, chiefly of the head, which the questioner unintentionally and unconsciously gave when he knew the answer and which the horse followed in tapping out his answer. Well known to psychologists all over the world, Clever Hans has contributed a psychological principle called the "Clever Hans error," referring to the unintentional effect that an observer can have on an animal.

Determined mind readers can take advantage of the same principle with humans, Professor Rokeach reports. As an example, if a person concentrates on the letter "P," his lips, in spite of himself, might form a different shape than if he were concentrating on "Q."

And illustrating the influence of small, unconscious body motions, there is the parlor trick in which the "mind reader" leaves the room while the subject hides an object, then returns, blindfolded, and grasps a handkerchief tied to the subject's wrist. Told to concentrate on the hiding place, the subject literally leads the performer to it by imperceptible movements.

Are your thought processes influenced by your body position?

Yes, in the belief of Dr. Hugo C. Beigel of Long Island University. He has charted responses to various situations by a group of subjects while in different positions.

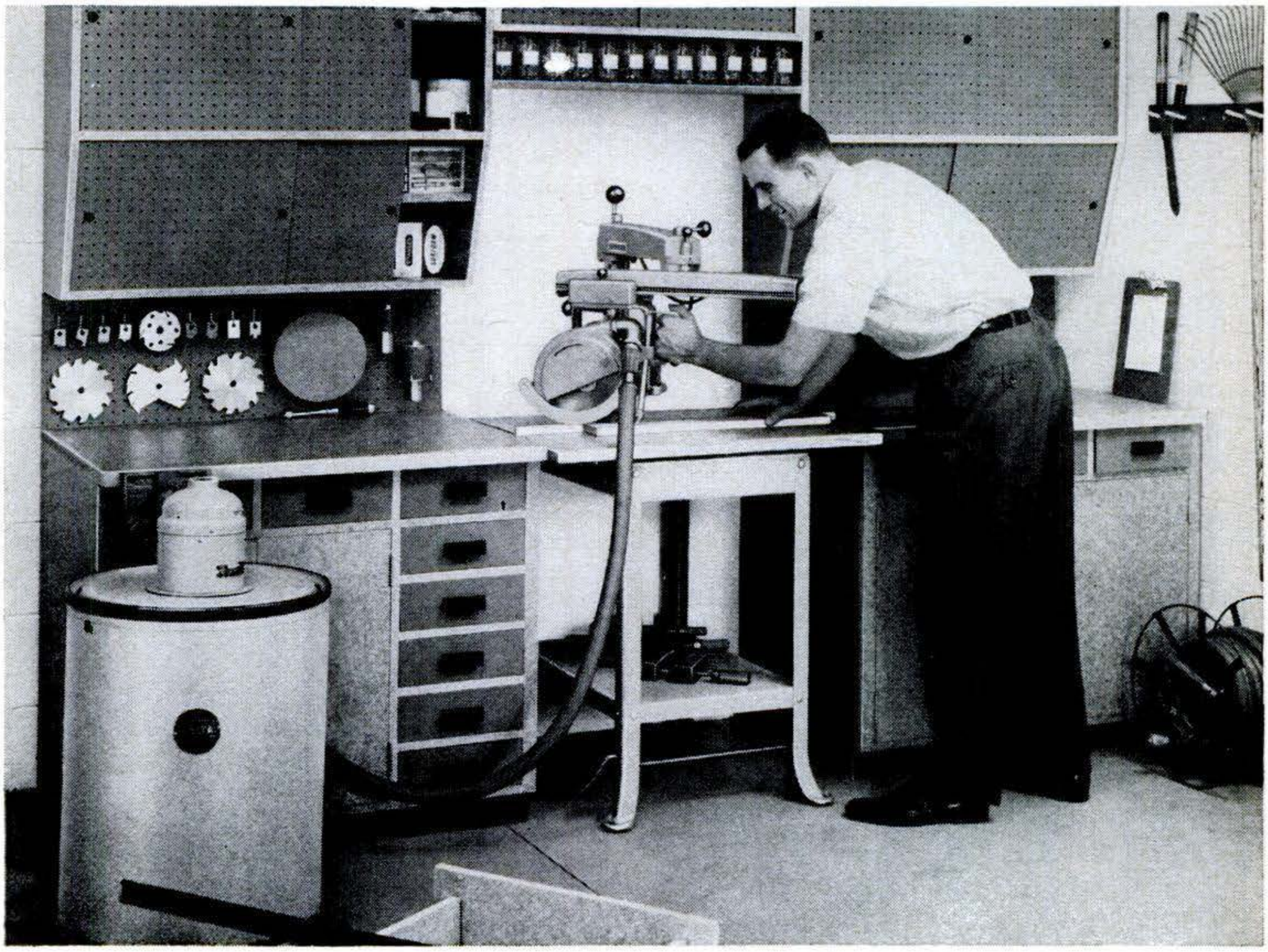
When you recline, if Dr. Beigel is right, your thinking is more complacent, you tend to have more associations and to let your mind range wider for ideas. In standing position, your energies are stimulated toward action, the thinking field is narrowed, influx of new suggestions is partly blocked, decisions come faster and are more vigorous. Sitting seems to favor a compromise between the opposing tendencies of standing and lying down.

Do mental warm-up exercises aid problem solving?

Recent investigations suggest that they may. In one study made by three UCLA

ROCKWELL-BUILT

DELTA "900" RADIAL SAW



most powerful radial saw built for home workshops

Rugged as it is good looking, the New Advanced Design "900" Radial Saw is powered by a *full* ¾ hp motor. And it's so versatile that actually it's a complete, *all-purpose* workshop! You can rip, cross-cut, drill, sand, shape and do many other jobs fast and accurately. Also shown above is the New Advanced Design Delta Dust Collector. Use it with *any* power tool to keep your shop free of sawdust—even to spray paint. It's powerful enough to pick up a 1″ steel ball.

IT'S SO EASY TO OWN THE BEST!

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BUILD THIS ALL-PURPOSE SHOP

Delta experts designed the compact workshop shown above so that you can build it in your garage or basement. Easy-to-follow plans and the New Delta Reference Guide are yours—for just 10¢—send your remittance with your name and address to Rockwell Manufacturing Co., Delta Power Tool Division, 504 F N. Lexington Ave., Pittsburgh 8, Pa.

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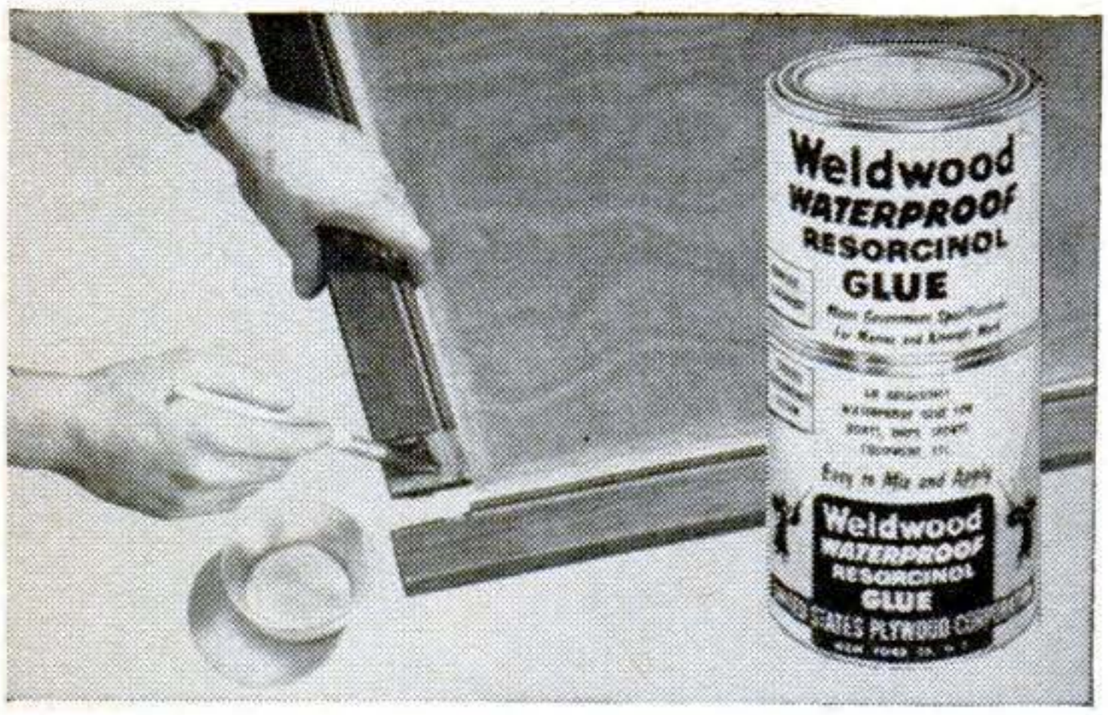

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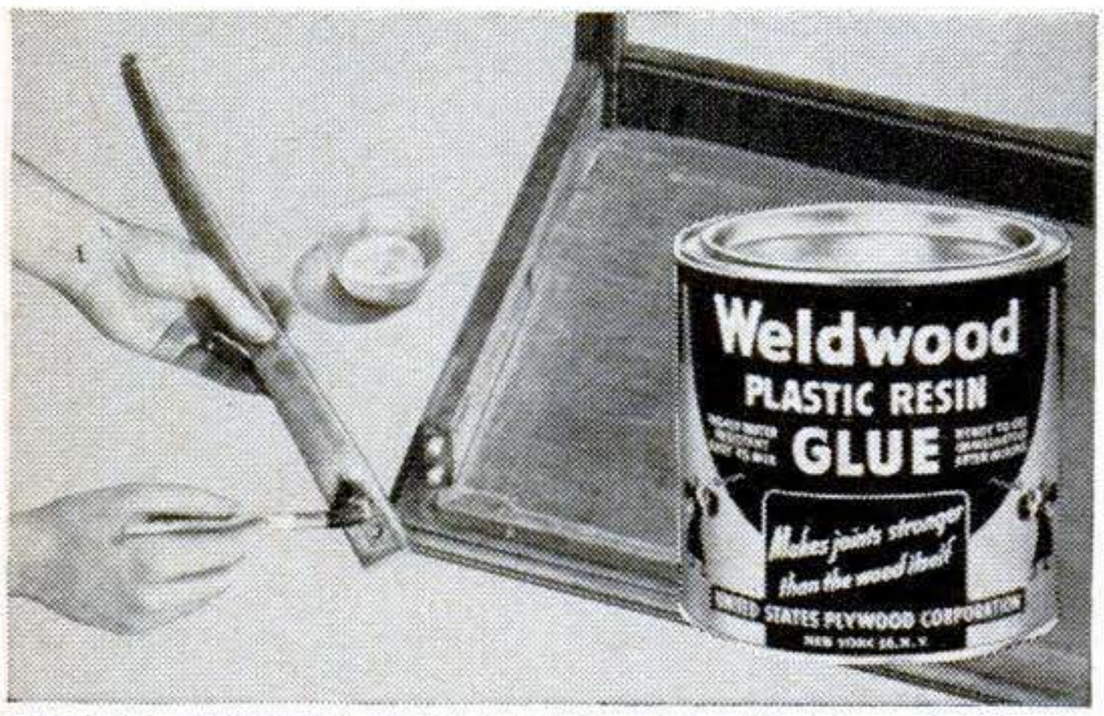

REPAIR WOBBLY TABLE LEGS with Weldwood Plastic Resin Glue. Mix with water to heavy cream consistency and apply to facing surfaces of joint, after removing old glue. Clamp, and reinforce with nails or screws if possible. Weldwood Plastic Resin Glue makes rigid, super-strong joints, unaffected by paint or lacquer. For all nonmineral porous materials. From 40¢.

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NAME.....

STREET.....

CITY.....ZONE.....STATE.....

psychologists—Dr. I. Maltzmar, Lloyd Brooks and Stanley Summer—a group of people were given, as a warm-up, a written test in which they were asked to suggest uses for unrelated objects such as a table leg, piece of balsa wood, and a string. After this, they were presented with a problem involving two strings suspended from the ceiling in opposite corners of a large room, a screwdriver, and a piece of balsa wood.

The problem was to grasp the two strings—one in each hand—without detaching or breaking them.

The solution was 1) to tie the screwdriver to the end of one string, 2) swing it, 3) then grab the other string and extend it to its maximum length, and 4) catch the first string on its upswing.

Subjects who'd experienced the written test solved the problem significantly faster than a control group with no warm-up.

What will happen to your mental ability as you grow older?

It will probably be greater at 50 than it was at 20. This finding, at variance with many previous conclusions, comes from a new study by the Office of Naval Research.

In previous studies, the same tests have been given to various age groups and the scores compared. Results have suggested that a peak of intelligence comes at 20 years and declines to something like a 14-year level by age 55. But this procedure, many scientists have thought, is erroneous. In recent years, young people have had more and more formal education. And it can be shown that the same individuals make higher scores on mental tests after a college education than before. Therefore, older people who generally have had less formal education are handicapped in testwise competition with younger ones.

In the new study, 127 men, who had taken the Army Alpha Examination when they entered Iowa State College after World War I, were retested 30 years later. They were competing against their younger selves. The results showed that actually they were intellectually more able at mean age 50 than they had been at mean age 19 when they were college freshmen. END

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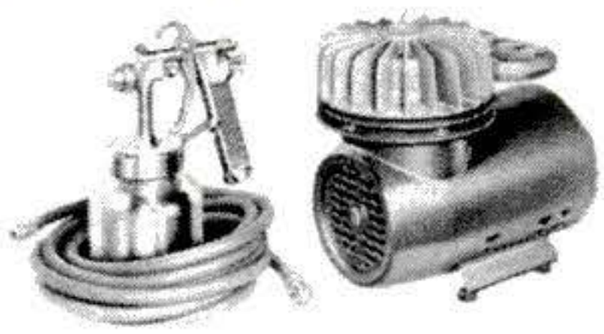

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Driving the Little German Ford

[Continued from page 55]

means livelier acceleration, which is exactly what the car is engineered for. In importing it, Ford of Dearborn can well be asking, "Will the U.S. public buy something that has pretty good snap when the light turns green—even if it has only four cylinders?"

Ford's imports from England cover 14 models in six different "lines": the Anglia, Prefect, Consul, Zephyr, Zodiac and Thames Estate Bus. The Taunus alone incorporates six models, in varying degrees of luxury, which may be another indication that Ford is probing the psyche of the American motorist with its newest import.

The four-cylinder Anglia and Prefect can't match the Taunus in performance. The Taunus can't match the six-cylinder Zephyr and Zodiac.

This German car differs also from GM's delightful little Opel. It's slightly costlier. It has a sassier engine. It's several hundred pounds heavier. Built on a longer wheelbase, it's nonetheless almost two inches shorter overall. But it trails the Opel on gas economy, and generally, it can't match the Opel's interior dimensions. The Taunus is advertised as a five-passenger car, but that's for midgets. It's for four adults.

The Taunus makes a contribution to simplified driving—an optional automatic clutch called the Saxomat, of the same stripe as powered clutches in the Simca, Renault, Citroen and (remember?) that Buick of the late 1930s. The Saxomat eliminates the clutch pedal. Just shift the lever on the steering column.

It works beautifully, but it's not for hot-rodders. A full second elapses between the working of the lever and the engagement of the next gear. Meantime, electrical relays have tapped the engine vacuum system to throw out the clutch and let it in again. Motorists who rest that right paw on the gearshift lever have a surprise coming—the slightest pressure on it throws out the clutch, and the engine races like a sheared-pin outboard.

Sales of the Taunus west of Nantucket lightship will be few this year. Ford targeted an importation of 5,000 of the cars in 1958. The company got a late start, and it will be doing well if it receipts for half that number.—*Devon Francis.*

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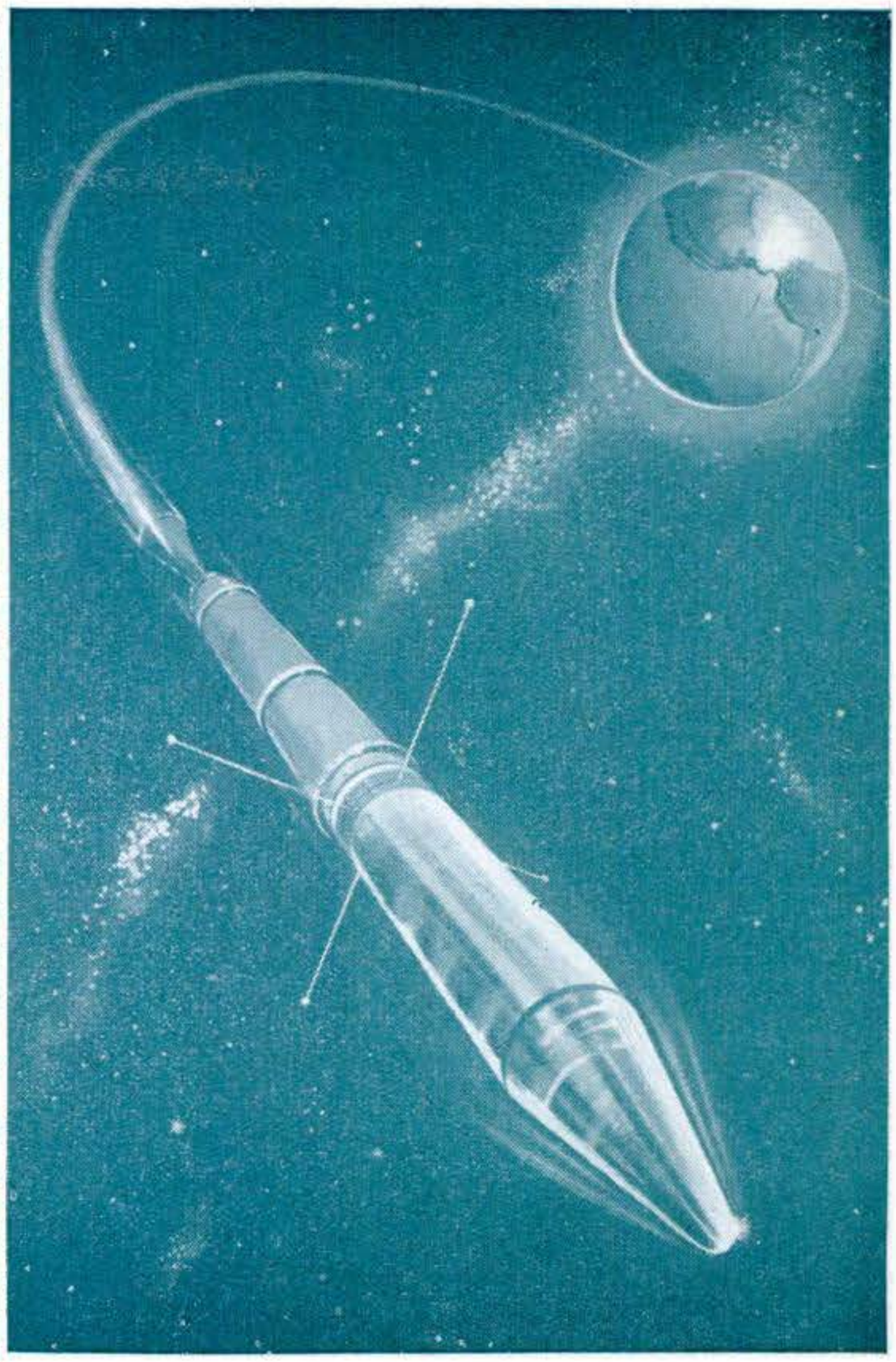

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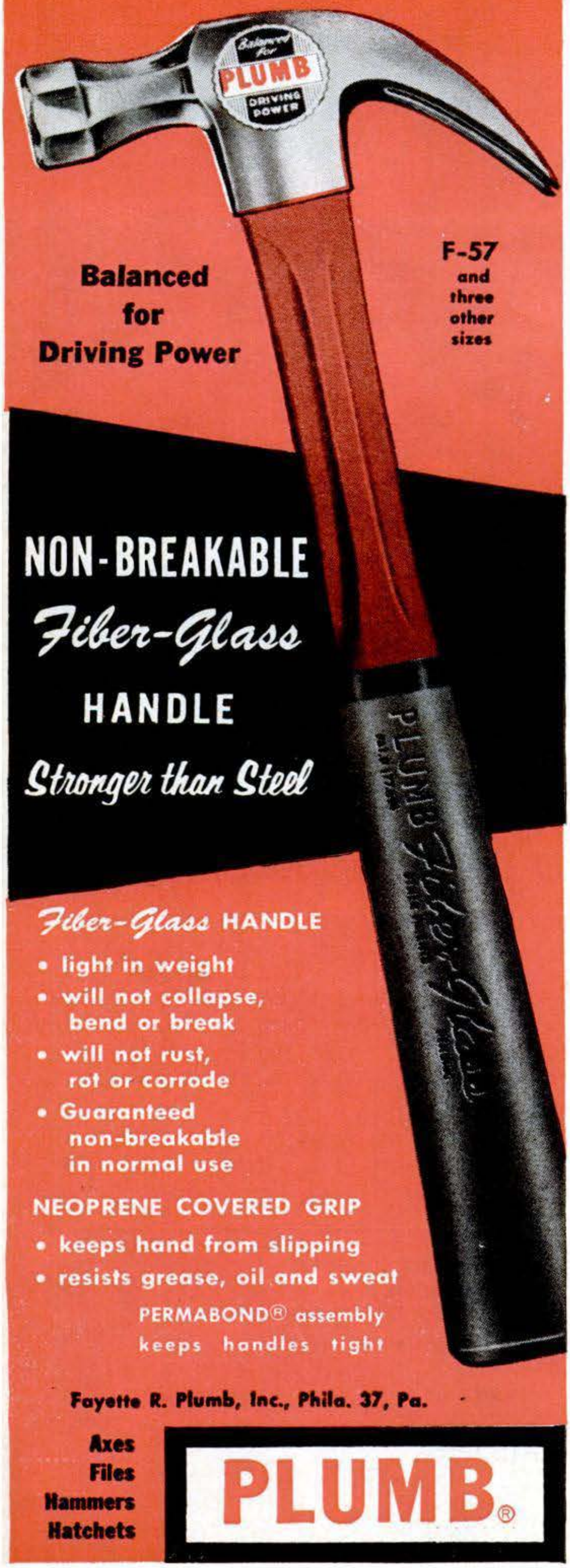

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[Continued from page 114]

ing the 13-pound suit, calls it "a tailor-made house." Under the loose outside layer is a very snugly form-fitting layer of nylon-and-plastic fabric. Cold air can be pumped into this coverall if the wearer gets too hot, warm air if he's chilly, and oxygen if he's having trouble breathing. The suit gets rid of the carbon dioxide he exhales. If the cabin pressure should fail, the suit will automatically inflate with oxygen from the plane's supply. Pressure and temperature regulators will go into action. The pilot can then count on an atmosphere within his head-to-toe sheath adequate to enable him to fly the X-15 back down to an altitude at which he can get along without artificial help.

The pilot can escape, if the plane itself should get into dire trouble, by jettisoning the cockpit, which will be in a capsule, finned to help control its fall. Increasing atmospheric pressure at altitudes low enough to be safe for the pilot to take to his parachute will cause a mechanism to eject pilot and seat from the capsule. The seat will then fall away and the pilot, using an oxygen supply in his parachute pack, will float safely to the ground.

The men who will fly the X-15 to the limits of its capabilities, in a long series of slowly expanded test flights beginning probably early in 1959, have been chosen. First among them to take up the dazzling new rocket ship will undoubtedly be Capt. Iven C. Kincheloe Jr., 29-year-old USAF test pilot, who, in the ill-fated X-2 research plane, has already flown to 126,-200 feet, the world's present altitude record.

Then will follow Joe Walker and the two other members of the NACA flight-research team at Edwards: John B. McKay, 35, and Neil A. Armstrong, 27.

Kincheloe, a blond, blue-eyed, big-eared former Michigan farm boy with a degree in aeronautical engineering from Purdue University, was a jet ace during the Korean War.

Walker, a sunny, easy-going individual from southwestern Pennsylvania, with a drawl that sounds as if it came from many miles south of there, won a D.F.C. and other decorations flying P-38s in the Mediterranean Theatre during World War II. He has a B.A. degree from Wash-

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ington and Jefferson, where he majored in physics.

McKay, a short, chunky Virginian, is an aeronautical engineer who got his degree at V.P.I. He was a naval aviator in World War II.

Armstrong, also an aeronautical engineer and, like Kincheloe, a graduate of Purdue, is a tall, slim, crew-cut blond pilot. He flew Navy fighter planes in the Korean War.

All of these pioneers are married and all are fathers. (McKay, like Scott Crossfield, has five children.) And their wives, like most test pilots' wives, take a resigned view of the dramatic and dangerous way their husbands earn a living.

Crossfield, Kincheloe and Walker already have a very good idea of what it will be like to fly the X-15. They have all made grueling "flights" in the Navy's giant centrifuge at Johnsville, Pa., in a gondola containing a working mock-up of the X-15's cockpit. An incredibly complicated and ingenious hook-up between gondola, centrifuge and an analog computer enables the pilot in the gondola to put the centrifuge through dizzying maneuvers that simulate the X-15's expected flight behavior. The gimbaled gondola, out on the end of a 50-foot rotor arm, can accelerate to a speed of 180 m.p.h. from a dead stop in seven seconds, and it can duplicate any "G" force that the X-15 pilot is likely to encounter.

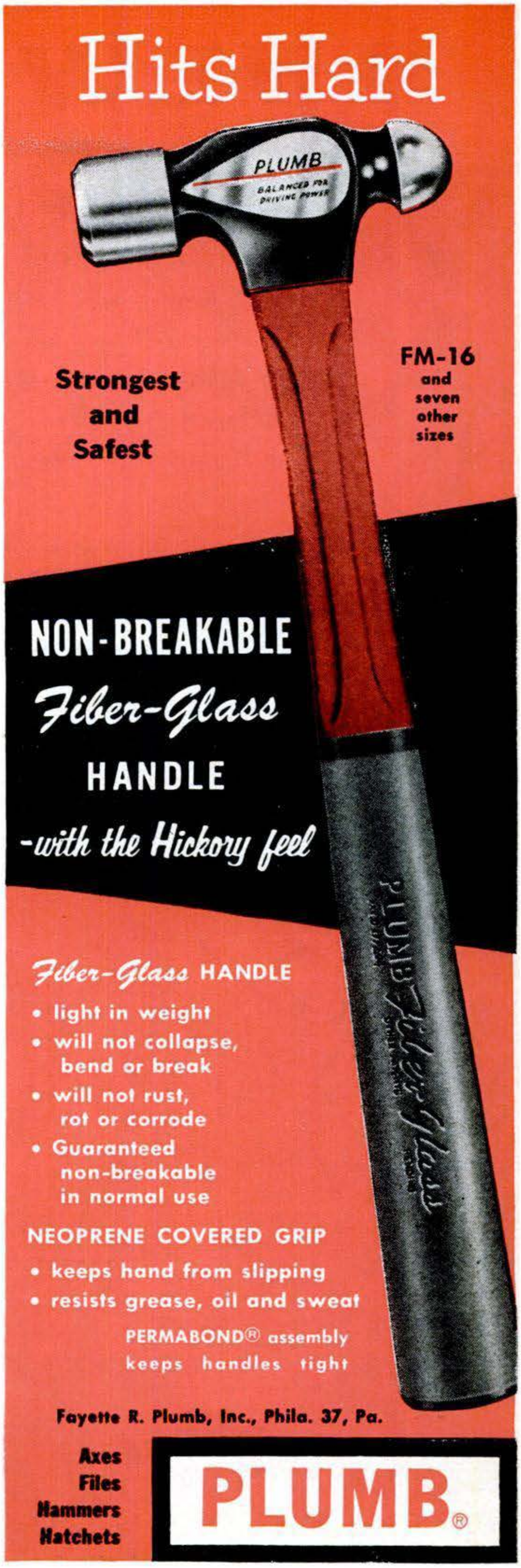
"No roller coaster could ever provide the sensation of going in so many different directions," the official *Naval Aviation News* declares.

McKay and Armstrong are scheduled to pilot the centrifuge this month.

Otherwise, the men who are going to take up the X-15 will not undergo any special physical conditioning for their history-making flights.

"All the flying we've ever done has been preparation for this," says Joe Walker.

However well prepared each may be for the first time he sends the X-15 barreling up through the stratosphere, it is certain to be the most exciting day of his life. The flight will last only about 20 minutes, from airborne launching to skids-down landing. But, as one commentator has remarked, it will probably seem like the longest 20 minutes in the history of manned flight. END



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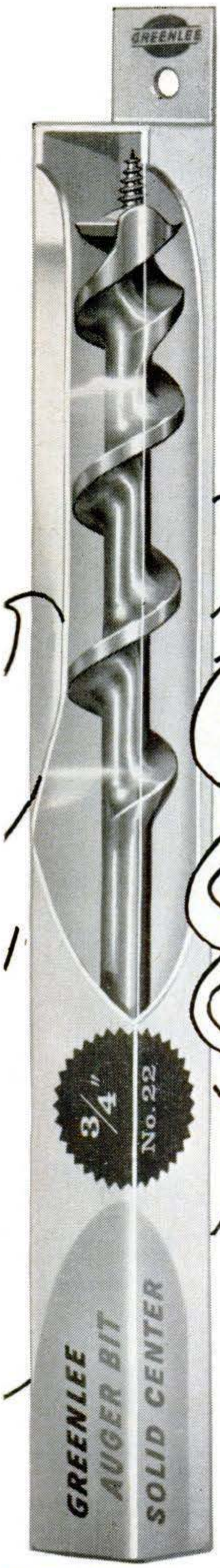

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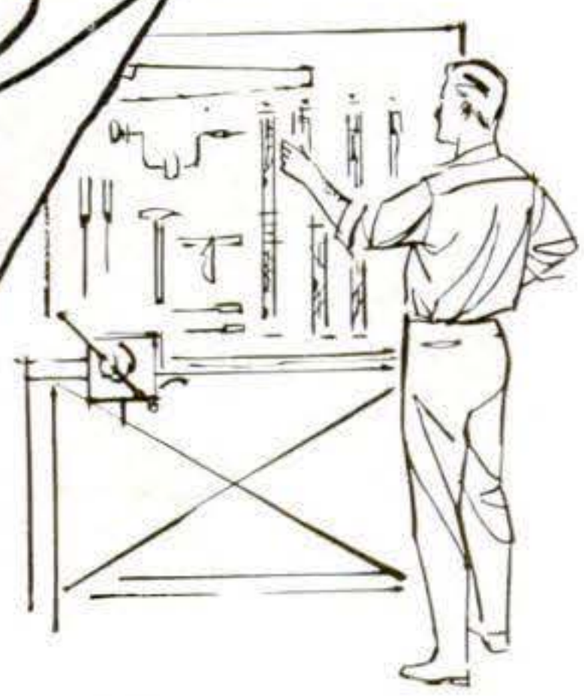

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Paints That Fight Fire

[Continued from page 73]

thing. But they don't really expect anybody to do that. Economically it doesn't make sense.

One man considered painting the exposed subflooring and joists—a very vulnerable area—in his cellar (a big one). He needed $400 worth of paint. Plasterboard for a ceiling would cost far less. And a simple home fire alarm could be bought for around $25.

So you have to consider the alternatives, weighing degree of fire protection against cost and ease of installation. Among the choices: plasterboard, asbestos panels, unpainted metal or plaster (especially over metal lath or rocklath).

Thought of that way, fire-protective paint would be logical on the subflooring and joists *near the furnace*. Little paint would be needed. And it's easier to brush on paint than to nail up ceiling panels.

Where fire-protective paints really make sense is in vulnerable house areas that must be painted anyway. Then the 50-percent premium for protection doesn't loom so large. For instance:

- Stairways, particularly the one leading to the cellar.
- Doors. Most important: those leading to the cellar or attached garage.
- Hallways, particularly the ceilings.
- Cellar area around the furnace.
- Corners of cellar and garage where you store inflammables (paint, gas, power mower, kerosene lantern).

Used in such places, good fire-protective paint makes sense. At little cost, it may bottle up a small fire or slow down a big one.

But remember: Paint merely helps. The only real fire protection is vigilance. People burn to death inside fire*proof* buildings. As UL senior project engineer Albin J. Stabb says, "The last thing we want to do is give anybody a false sense of security."—*Martin Mann.*

Next Month: Get all the facts on new '58 window fans before you buy. You will learn why sizes are tricky, how to tell how much capacity you need, and what you get for your money in a special shopping report in July PS.

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IS AN ENGINE OIL SUPPLEMENT REALLY IMPORTANT?

What's the reason for using a good engine oil supplement, or engine oil concentrate? And exactly what do these products do?

All automobile engines develop corrosive acids, rust-producing fluids and gummy deposits as a natural result of combustion.

Under ideal driving conditions, your car's engine is able to combat these destructive by-products as they are formed. But to insure the job is done most effectively under all driving conditions, Chrysler Corporation Engineers have developed MoPar Engine Oil Supplement (replaces 1 quart of oil at the time of oil change) and MoPar Engine Oil Concentrate (added to your crankcase *between* oil changes). These products: (1) retard rust by chemically neutralizing corrosive acids, (2) coat metal surfaces with a protective oil film that clings even after engine oil has stopped circulating, (3) provide added protection against rapid wear of valve tappets, (4) inhibit formation of sludge formed by oil oxidation and (5) help keep hydraulic valve lifters, piston rings, valve stems and guides free from harmful deposits.

The result is a measurable improvement in power and pickup. You'll *feel* your engine running quieter and smoother—longer.

And for a good all-round engine clean-up, use MoPar Carburetor and Upper Cylinder Cleaner. Poured directly into the carburetor throat, it chemically removes deposits blocking the fuel system, frees sticking valves and sluggish rings, and leaves a lasting protective film on all upper engine moving parts.

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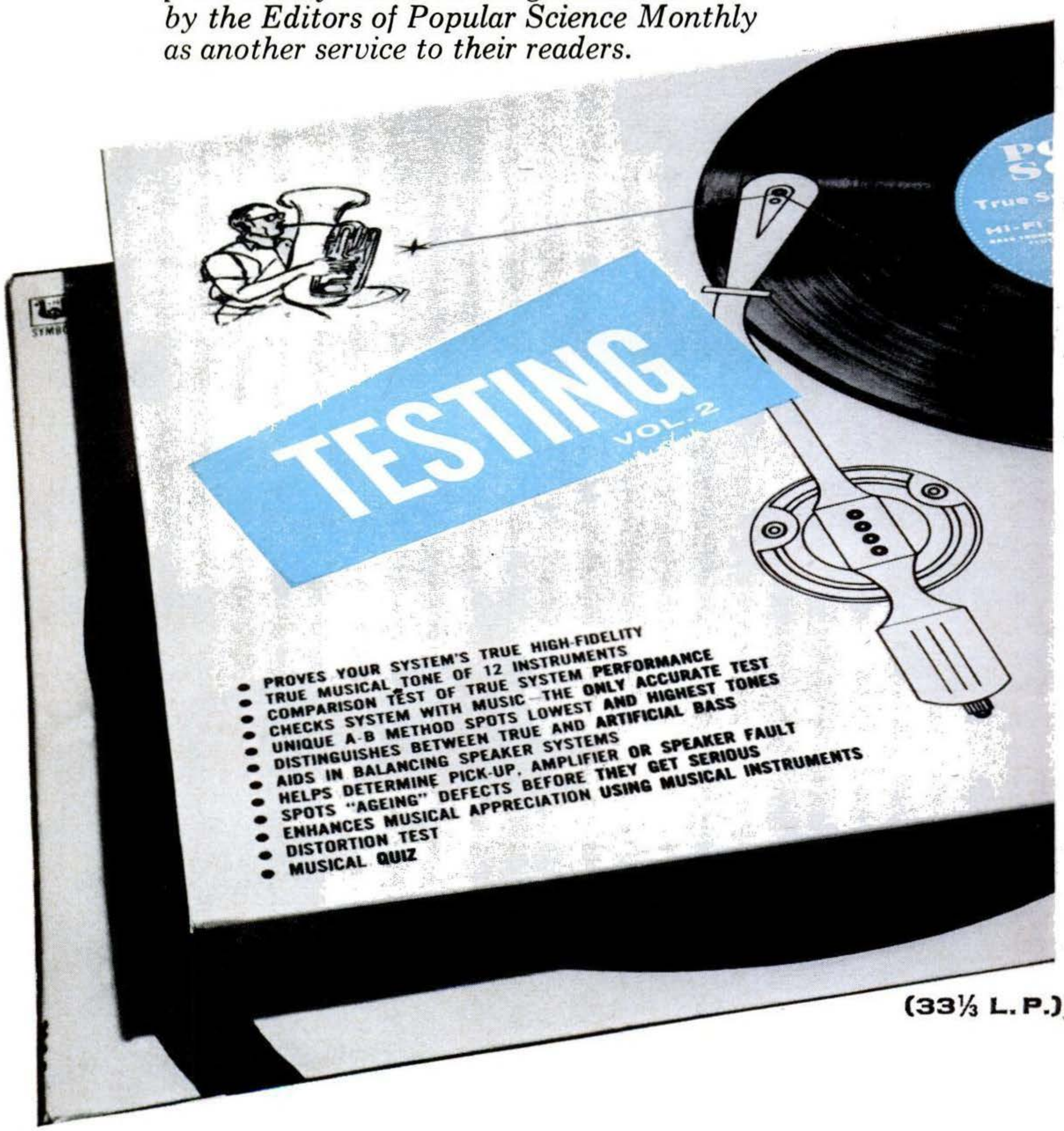

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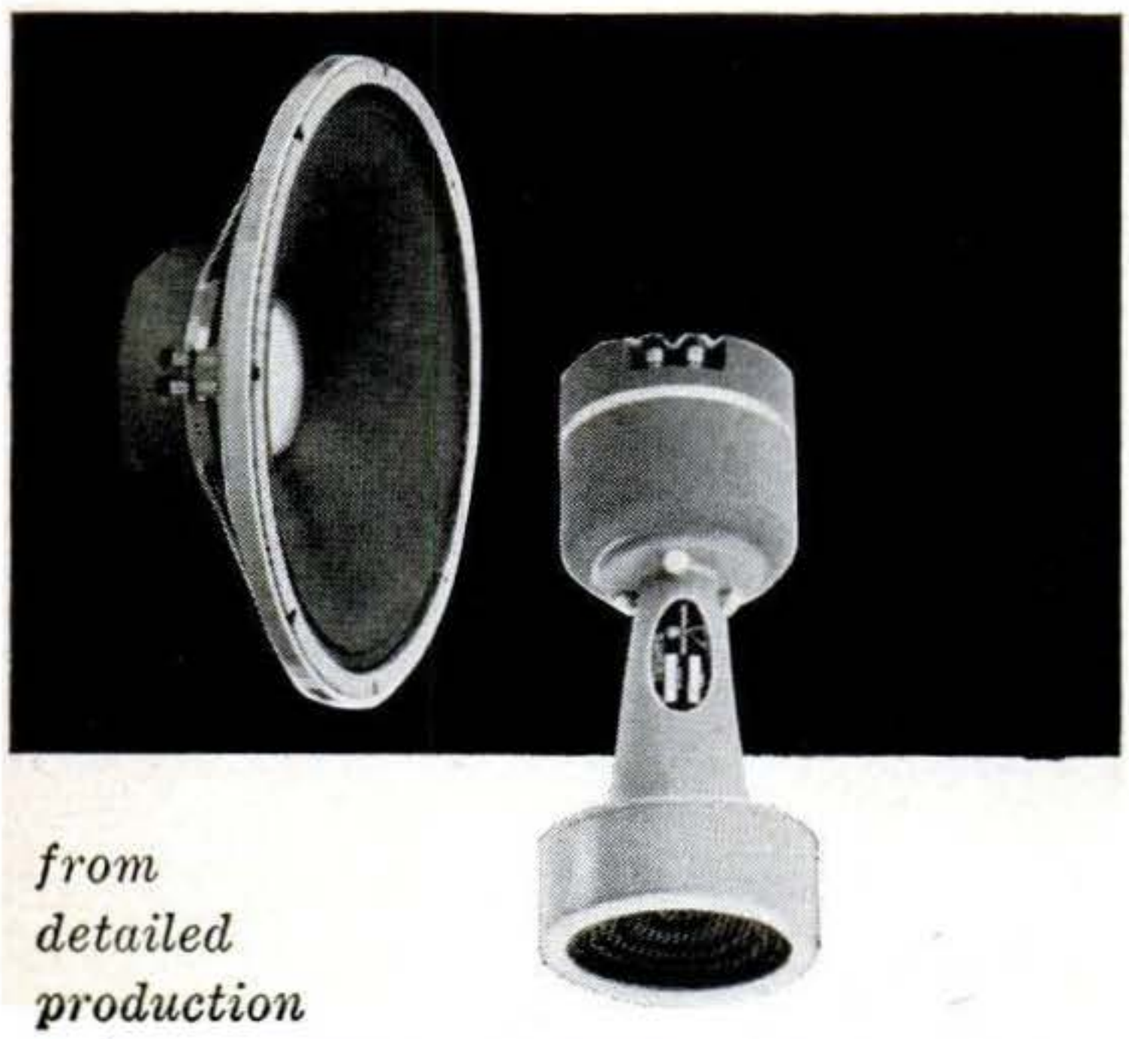

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C34

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Where Are Those U.S. Small Cars?

[*Continued from page 53*]

can be advanced for Detroit's producing small cars:

1. Uncertainty and worry may drive the motormakers into it.

They aren't *really* sure that the market for small cars is limited. Two elaborate surveys recently have been made by competing Detroit manufacturers to find out why U. S. motorists buy small cars. One survey concluded that the small car sold mainly because it is a prestige item. The other one, just as conclusively, showed that the small car sold mainly because it's economical. It was not necessarily a "second car."

If the sale of small cars continues to snowball, European factories owned by Detroit manufacturers won't be able to keep up with the demand—there won't be enough shipping space in ocean liners. Shipping space already is becoming critical; Renault has had to lease a group of ships exclusively to transport its cars.

2. Detroit knows that in some degree its cars are priced out of the market.

In 1950 U. S. factories produced and sold 6,665,000 passenger cars. With the single exception of the year 1955, that figure has not been reached in any year since then—notwithstanding a growth in America's population of 18,770,000 and an annual increase of 800,000 new households in that period.

Car buyers obviously have been resisting the prices asked. Buyer traffic is swelling through the used-car lots, not through the salesrooms.

3. The Big Three are not producing any low-priced cars.

In "improving the product," they have left big holes at the bottom of their price structures. Eight years ago the lowest-cost Ford V-8 four-door sedan had a factory-advertised delivered price of $1,545. Today the comparable lowest-cost Ford carries a tag of $2,225. (The same thing has happened to Chevrolet and Plymouth.) These cars have been "upgraded." They're fancier, bigger, heavier, higher-powered and costlier. No longer are they symbols of economical transportation. Even Studebaker's stripped-down Scotsman is offering extra-cost options.

So, to fill the price holes (into which American Motors and importers of European cars have rushed), Detroit may

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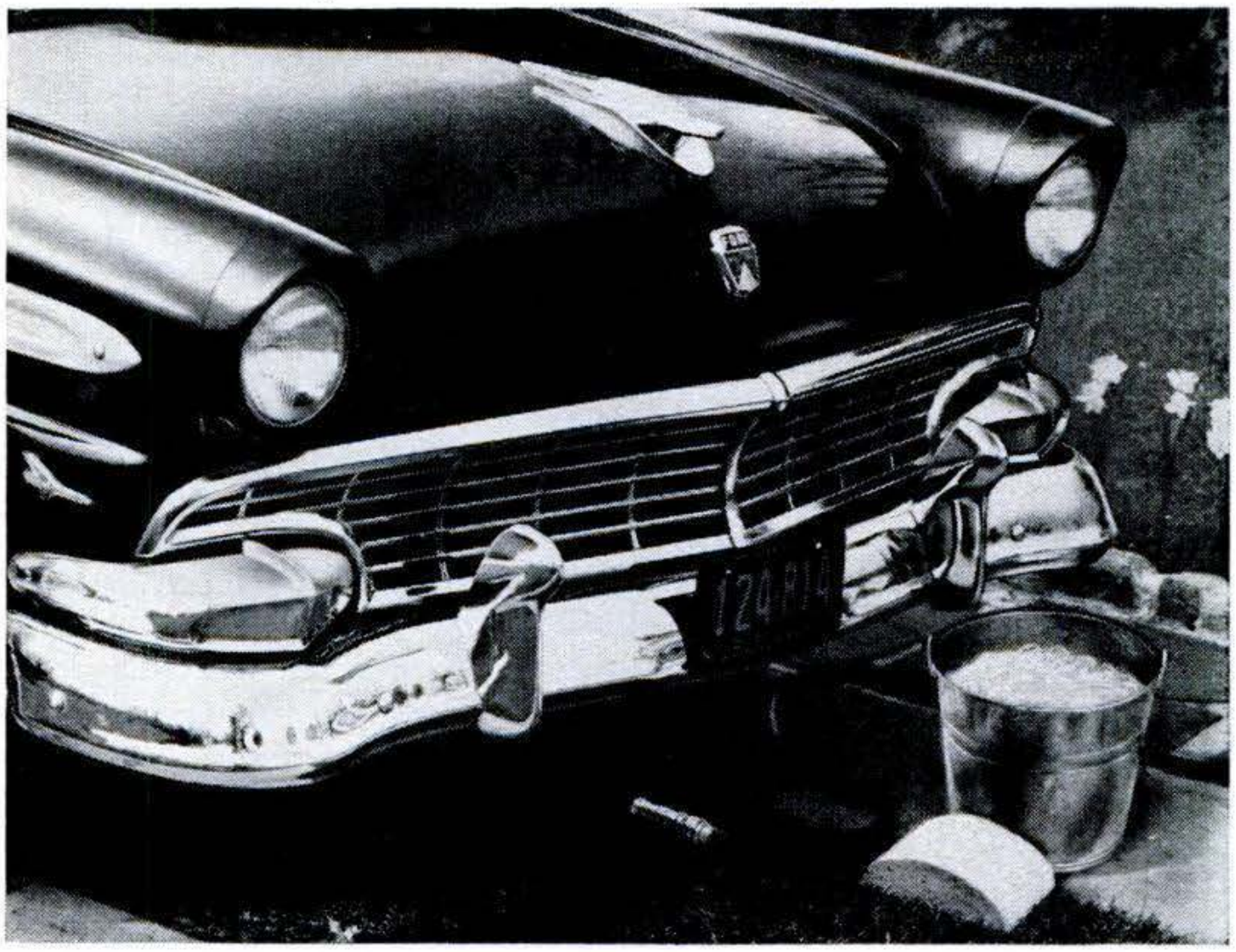

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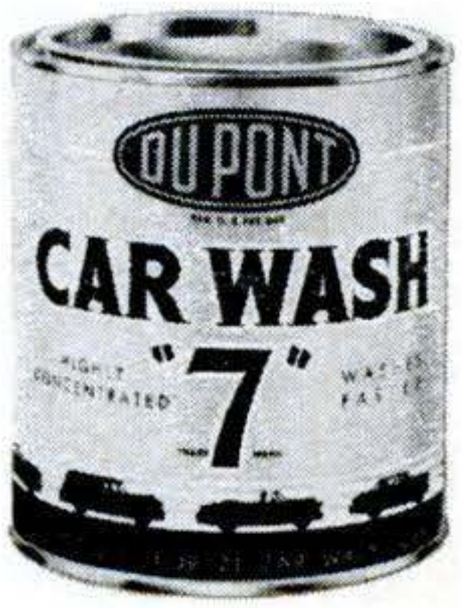

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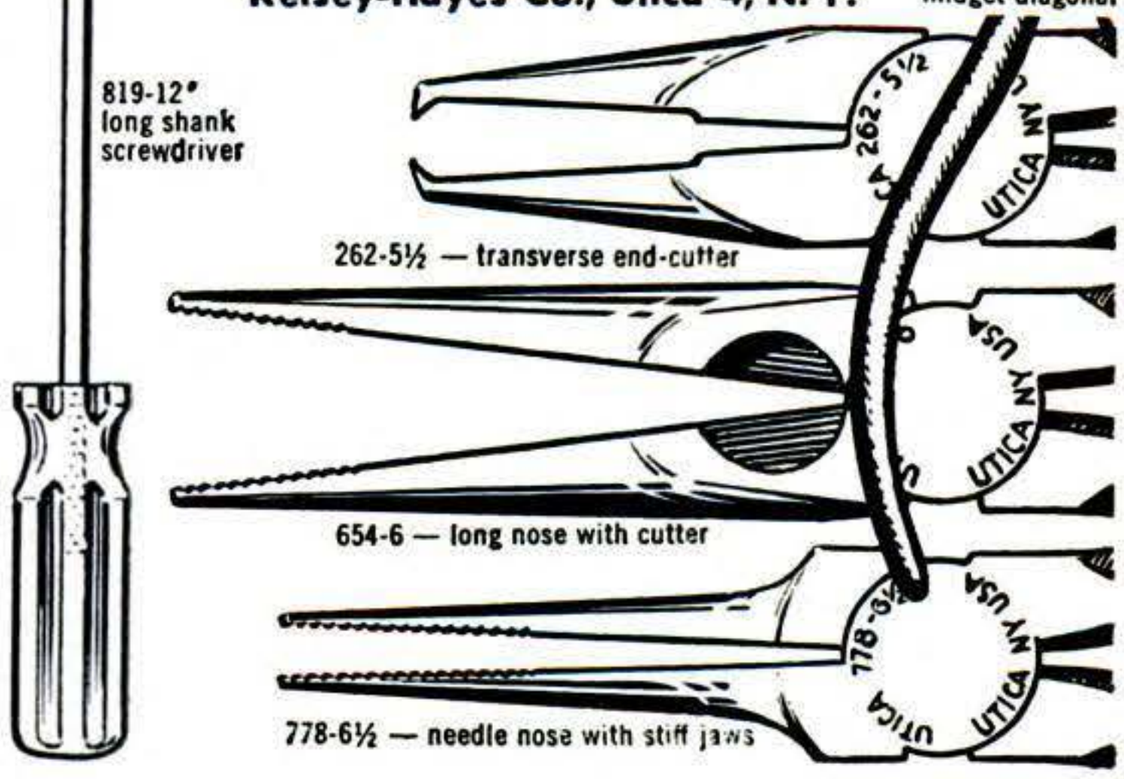

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	Yes	No
1. Are you between 35 and 45 years old?	.....	.....
2. Have you an education beyond 8th grade graduation?	.....	.....
3. Are you married?	.....	.....
4. Do you have 3 children or less?	.....	.....
5. Do you own (or are you buying) a home?	.....	.....
6. Have you lived at present address 2 years or longer?	.....	.....
7. Were you at your previous address 2 years or longer?	.....	.....
8. Have you a telephone at home or at your place of business?	.....	.....
9. Is your car at least 3 years old?	.....	.....
10. Do you belong to a church, lodge, club, YMCA, veterans' or civic organization?	.....	.....
11. Have you been on your present job at least 2 years?	.....	.....
12. Were you born in a town with less than 50,000 population?	.....	.....

Now—count the "yes" answers. If you have 8 or more, you may be on your way to being your own boss.

Everybody respects a man who is his own boss. And they notice his family lives a little better than most. Perhaps you've thought about running your own business too but put off doing anything about it many times because in the first place, you don't have any idea about how or where to start. You probably asked yourself: If I do start my own business, what would I be best at? A hardware store? A restaurant? A filling station? Certainly you wondered too if you could raise the money and how much it would take—$5,000? $10,000? $50,000?

For people like you who have seriously thought about running their own business, the Bowes "Seal Fast" Corporation has prepared a booklet with most of the answers to these questions. We call it, "So You Want To Be Your Own Boss!" In it a number of different small businesses you might be interested in are described and compared as to work, investment and possible profits.

This booklet also tells why Bowes is now offering a few men a chance to become automotive distributors selling to service stations in protected territories.

If you're not afraid of hard work and can make a reasonable investment you may get a chance to become one of these distributors. If Bowes picks you, you will be thoroughly trained until you are well on your way to a solid, gamble-proof income.

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have to make smaller, lower-priced cars.

4. U. S. manufacturers are becoming sensitive to the onerous running and maintenance costs of their products.

One year's overall car expenses—including depreciation, insurance, interest on the investment and upkeep—frequently exceeds the payments and upkeep on a home. On one item alone—fuel consumption—motorists have been getting increasingly irritated. With horsepowers at all-time (and occasionally ridiculous) highs, cars don't go very far on a gallon of gas. By contrast, the small car has a modest appetite at the gas pump.

5. Detroit has begun to suspect that the automobile is "conspicuous consumption" for fewer and fewer buyers.

For a decade, manufacturers have hammered away, with styling, power and sales pitches, on the theme of "keeping up with the Joneses." A growing body of motorists is failing to respond. Others are still keeping up with the Joneses, but with less costly hardware, like automatic clothes dryers and hi-fi sets.

6. Detroit may have to produce small cars for prestige and competitive reasons.

The executives who have to make the decisions are worried not only because of today's flagging sales but also because of what rival companies may have up their sleeves. If one big company jumps in, the others may have to compete.

7. Small cars may be needed to keep dealers happy.

The dealers are the prized core of Detroit's marketing organizations. The character of the "dealer body" can create a "good year" or a "bad year" in sales. Today thousands of dealers in standard-size cars are hurting. To boost lagging sales, many have added the Rambler and European imports to showroom displays.

8. Finally, the sheer pressure of public opinion may drive U. S. manufacturers to small cars.

The Big Three *are* big, and vulnerable. Millions of motorists, who may never buy small cars, cotton to the notion that they should still be available. They complain, "Why don't they make a Model A again?" and "they" inevitably means General Motors, Ford and Chrysler. If the sale of small cars continues to gain momentum, the Big Three may have to

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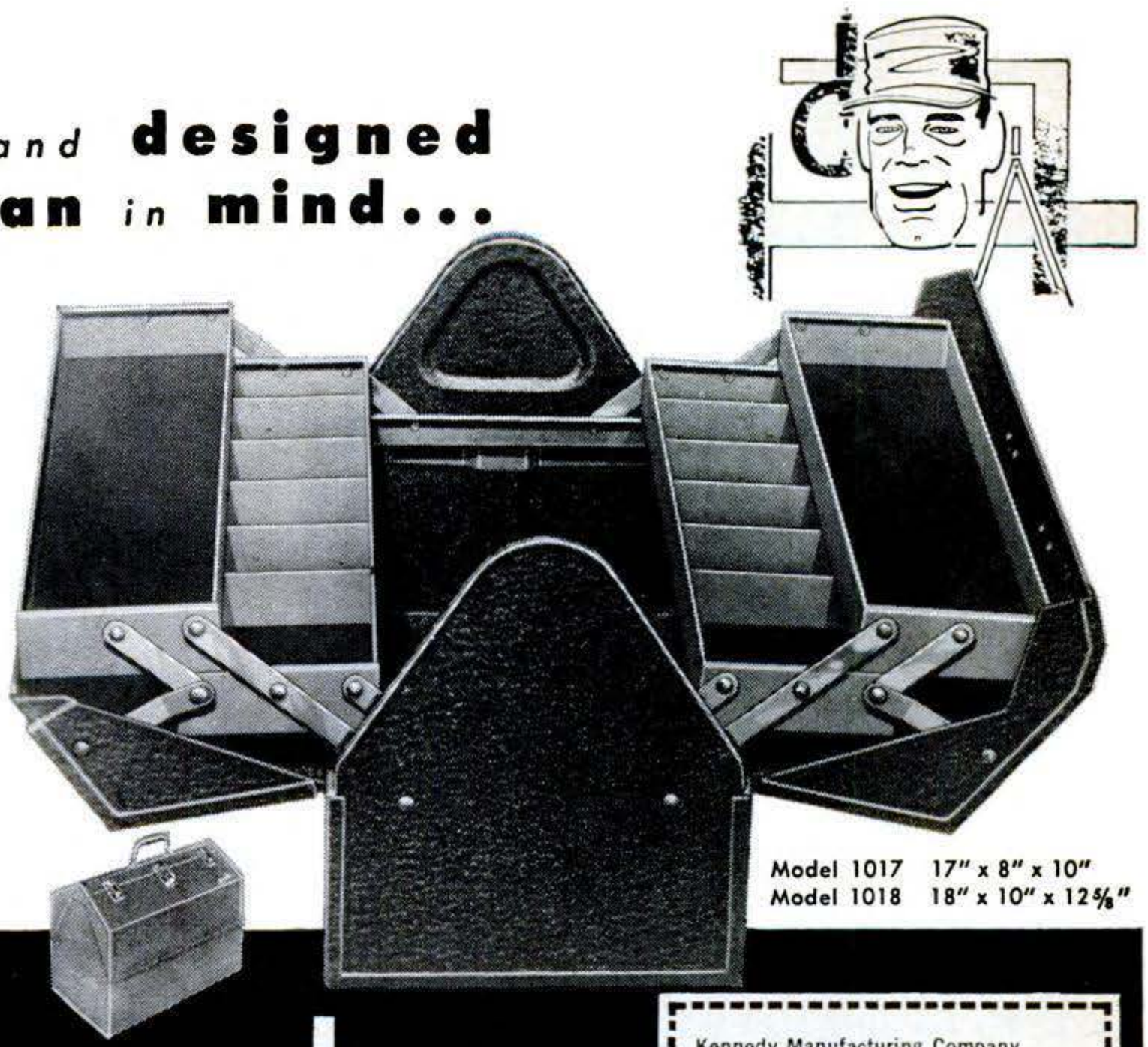

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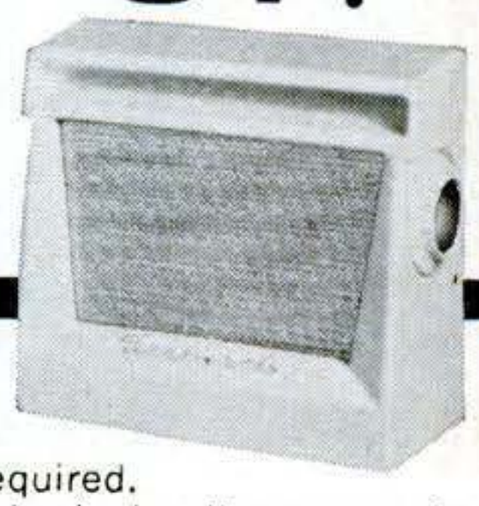

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produce some or face a charge that they are cheating American car-owners of their birthright.

GM and Ford are poised for a decision. Chrysler isn't so ready, principally because it has not had the financial resources to consider so bold a move. Chrysler is on the hot seat. It cannot afford to be without a small car if its competitors have one—unless the car flops.

Getting ready to produce small cars has become a cloak-and-dagger operation. The extreme measures being taken by GM to conceal its small-car projects is demonstrated by the way in which recent engineering drawings for a six-cylinder engine were released to tooling firms. The bids were issued as sketches, not as bona fide blueprints. Tooling firms that received the sketches (via the Chevrolet Division) say they were not even labeled with words that would give a clue to the source.

Next Month: An auto accident could cost you every nickel you have. July PS tells you how to protect your pocketbook—and yourself. Don't miss this bonus booklet: "What to Do If You Have an Auto Accident."

GM is making it rough on spies by issuing blueprints for tool-and-die work on its small Australian car, the Holden. No one, viewing the prints, can be sure whether the component in question is for a Holden or a domestic small car.

It's well to bear in mind that the issuance of orders for tools and dies is no guarantee that Detroit will build small cars. GM and Ford can well decide *after* all the tooling is done that it would be cheaper to junk the stuff than to go ahead with cars that the public wouldn't buy.

The U. S. motorist can be sure of one thing more—the sales of U. S.-made automobiles in 1958 will have little effect on the decision. The manufacturers plan their products on the basis of sales and trends over long periods of years. To them, business booms and recessions are merely departures from norms—phenomena on wall charts. They will produce small cars only if, at long last, they decide that a great tide has turned and the time has come. **END**

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[Continued from page 62]

it off, thousandth-of-a-second by thousandth-of-a-second.

Take Experiment 43. Two '56 sedans —one unitized, one frame—rammed at 47 m.p.h. In the unitized car, inertia kept the point under the driver going for .005 second. Then it started slowing. In .026 second the front bumper collapsed and the point under the driver was decelerating at about 30 G. At .050 second the deceleration rate under the driver zoomed to 79 G—79 times greater than the acceleration of gravity. Then the deceleration eased up. At .110 second this underbody point started to bounce backwards. By .150 second it stopped moving altogether.

The rear of the car slewed around four feet. The engine was pushed back, the left front wheel forced through the floor against the driver. The underbody was crushed back to the front axle on the left, and the body bent somewhat as far as 13 feet from the front bumper.

Much the same happened to the frame car, but the point under the driver began slowing later (.010 second), reached a lower peak deceleration (53 G) sooner (.040 second), then eased to a total stop (.150 second) without bouncing backward.

That's the car. What of the driver? Unbelted, he didn't start slowing until after the car did. That's bad. He flew.

In the unitized car, the driver began to decelerate at about .030 second. By .039 second he (and his seat) had slid forward a few inches. At .044 that cannon shell, the steering-wheel hub, was at his chest. By .068 second he was getting its full wallop. The deceleration on his chest was 68 G, and the blow was the same as if somebody had dropped a 6,800-pound weight on him. At .092 second he hit the windshield. Around .100 second he bounced back. At .113 second he got slammed by a passenger flying from the rear seat, bounced around some more, and finally halted at around .200 second.

In the frame car, the driver bounced backward *before* the steering-wheel hub delivered a 7,500-pound jab to his chest, then bounced once more before stopping (also around .200 second).

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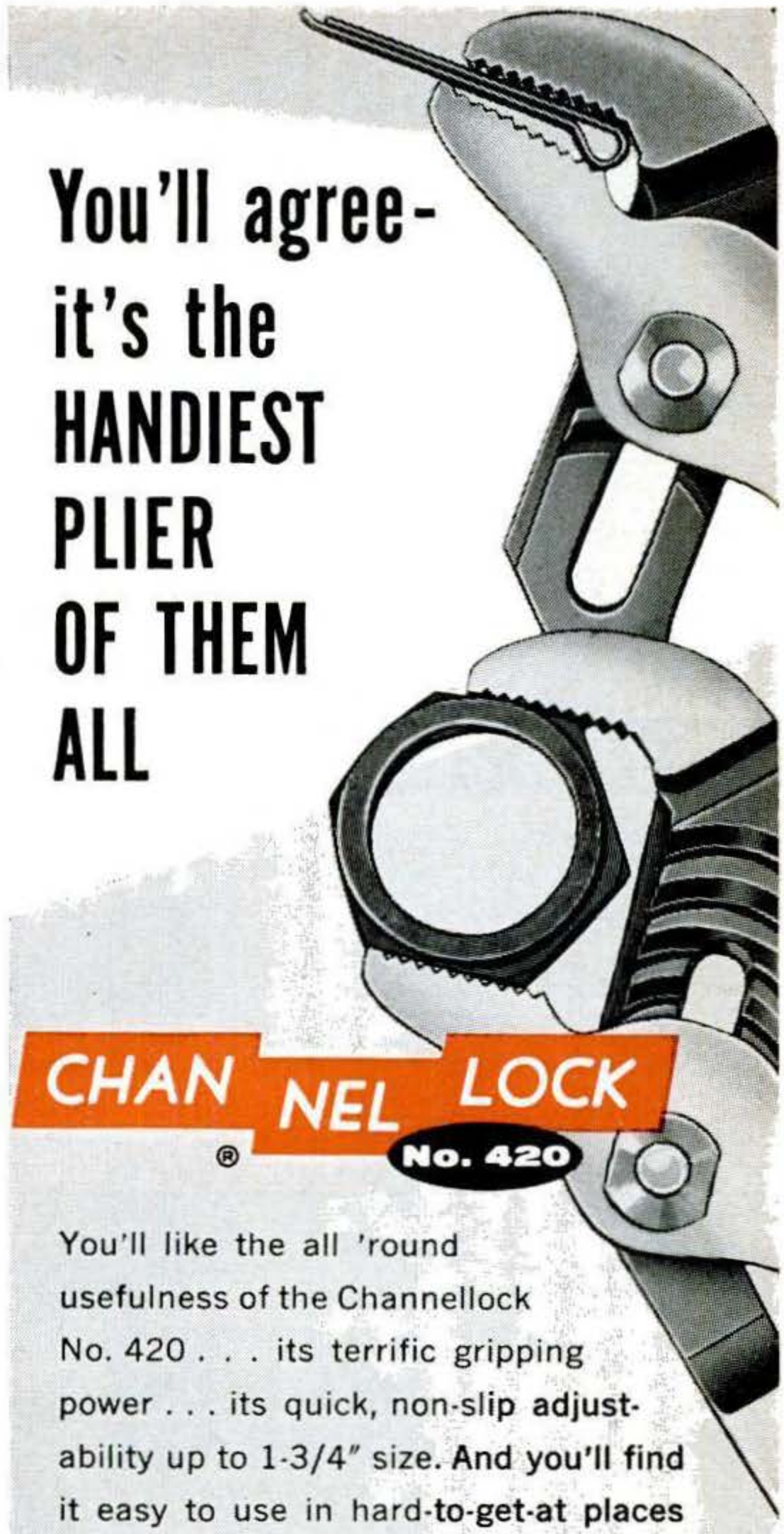

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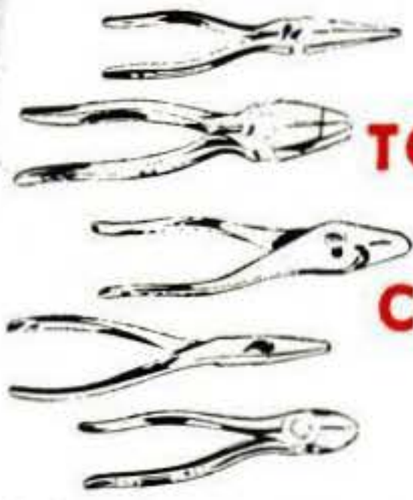

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his chest (to say nothing of getting his head battered), the answer is no. A physician examined the dummies after the crash, classed both as dead drivers.

Each of these cars carried rear-seat passengers. The deceleration of the car body under them was less (45 G in one, 46 G in the other) than under the driver because crumpling metal up forward absorbed some of the impact. Deceleration on the passengers, however, was almost as great as on the drivers. Two passengers had seat belts; their deceleration began earlier and increased more gradually.

Partly because of the belts, partly because the rear seat offers more room for flying around, the two belted passengers came through better. One (in the unitized car) was rated a definite survivor, the other a probable fatality.

How the cars held up. Collisions at 40 and 50 miles an hour are a rough test of the design of an automobile. Do the doors open? What happens to the steering wheel? The windshield? The seat belts?

All these things, and more, the UCLA scientists tell in cold, gory detail.

Doors. The frames twisted enough to permit doors to swing open, but only one did—"a tribute to the improved safety door latch," says Severy. More doors might have opened if the collisions had caused more sideways force. In the two old cars, the doors were difficult to open after a low-speed (21 m.p.h.) collision.

Windshields. They shattered forward. None popped out whole. Jagged remains of the wraparound stayed put.

Seats. All front seats tore loose to ride the drivers' backs. Their added weight made injuries worse.

Steering wheels. The wheel and post, rigidly attached to the front of the car, moved back and up to catch the forward-flying driver in chest and head. The dished wheel was little help. The driver's body collapsed the wheel, still got speared by the post.

Safety belts. In the 47-m.p.h. collision, both belts broke. Their tensile strength was rated at 8,000 pounds—*four tons*—twice as strong as good standard ones. In another test (at 52 m.p.h.), a 16,000-pound belt and its bolts held—but the floor pan of the car gave way.

Unitized vs. frame construction. Unit bodies performed better—crumpled more

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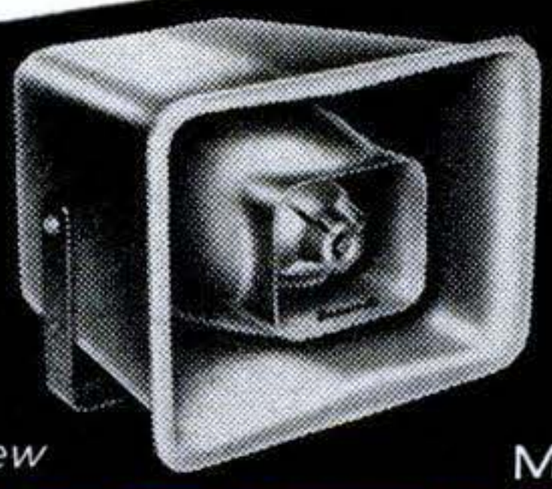

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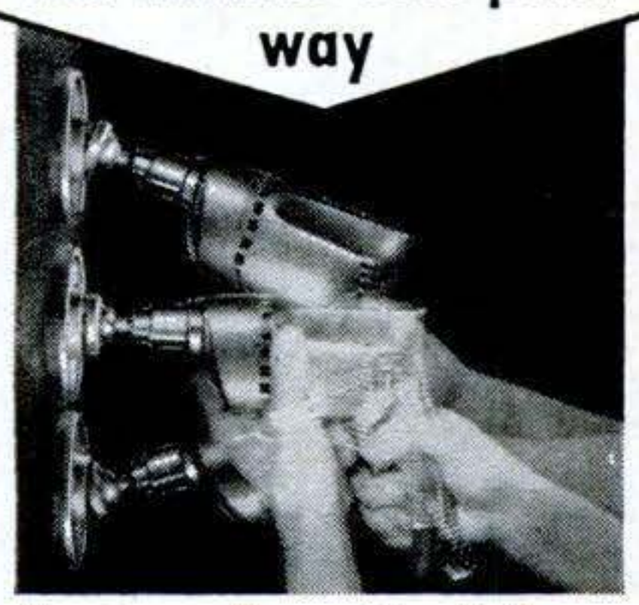

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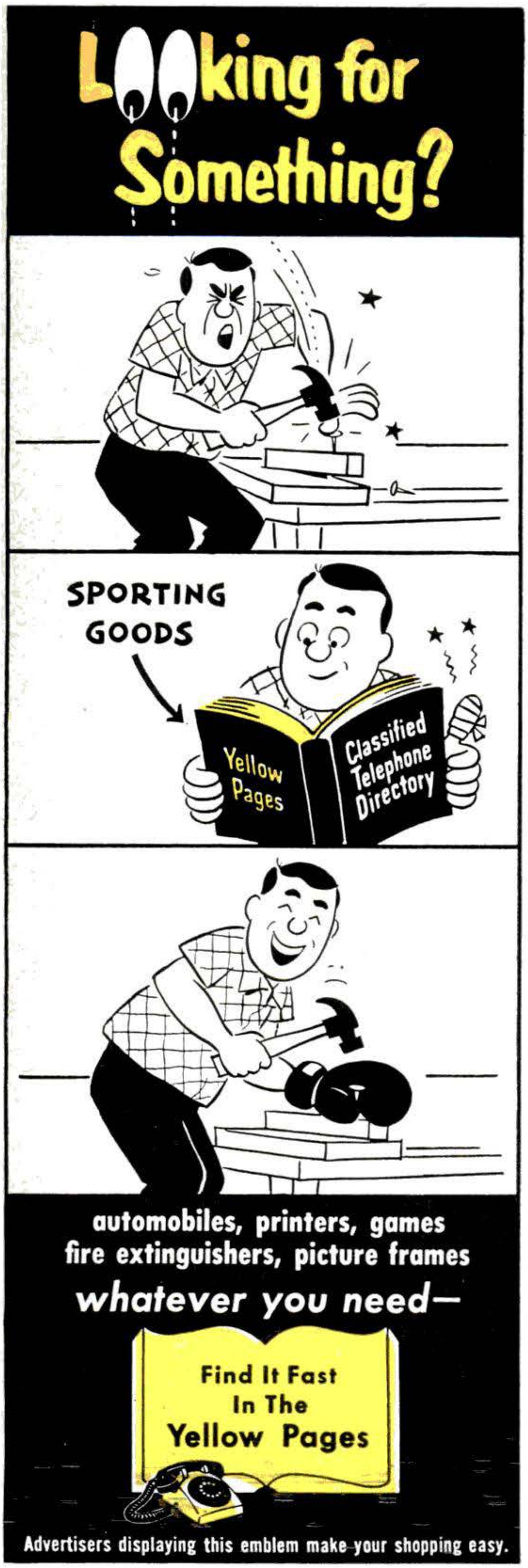

and bounced back less—in 20-to-30-m.p.h. collisions. Frame bodies were better at 45 to 55 m.p.h. But the difference was small and the conclusion was: "The chances of survival are approximately the same in either . . ."

This last result was a disappointment —to put it politely—to American Motors, long-time proponent of unit bodies and one-time financial angel for UCLA research (but not these tests, which were supported by Parish Pressed Steel, a neutral in the unit-versus-frame argument). At the same SAE meeting that Severy reported to, AMC executive body engineer Carl W. Cenzer spoke up. Interspersed with faint praise for the UCLA work were some properly taken reservations: Front-end collisions aren't the whole story. Unitized construction, Cenzer believes, has other safety advantages.

What should be done. At points, Severy and his assistants relax the reserve traditional in technical reports and aim pointed suggestions at auto designers. For instance:

On seat belts, the report says: Make them stronger (8,000 pounds) and wider (three inches), and *use them*—"the chances of survival are greatly increased . . ."

On steering mechanisms, the report says: Put a splined joint behind the firewall (so the post will give instead of riding back into the driver), and broaden the hub (to spread impact forces over a greater area of the driver's body).

On design details, the report says: No exceptions *ever* to the rule against sharp objects inside the car. Put rear-seat ash trays in the rear armrests (not in the backs of front seats, where they gouge the heads of forward-thrown passengers). Make instrument-cluster visors of flexible plastic (present rigid visors seem safe beyond the steering wheel, yet they sliced the hard plastic nose off one dummy and neatly decapitated another).

Will anything be done? Could be. The auto industry is very touchy about safety —and getting touchier.

Last winter Alabama Congressman Kenneth A. Roberts introduced a bill requiring cars to be equipped with "reasonable safety devices." He called for improved design of the very same car parts that Severy indicted as dangerous. END

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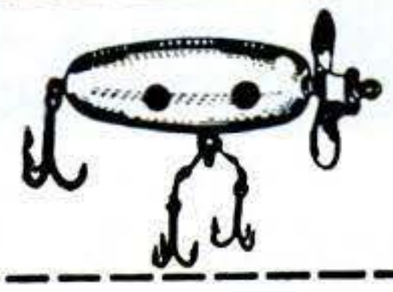

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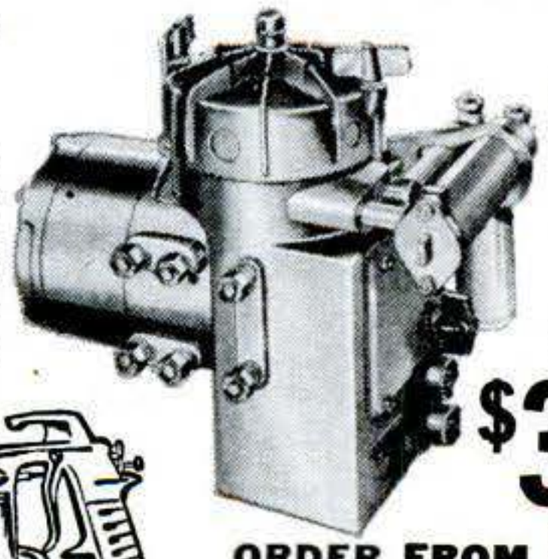

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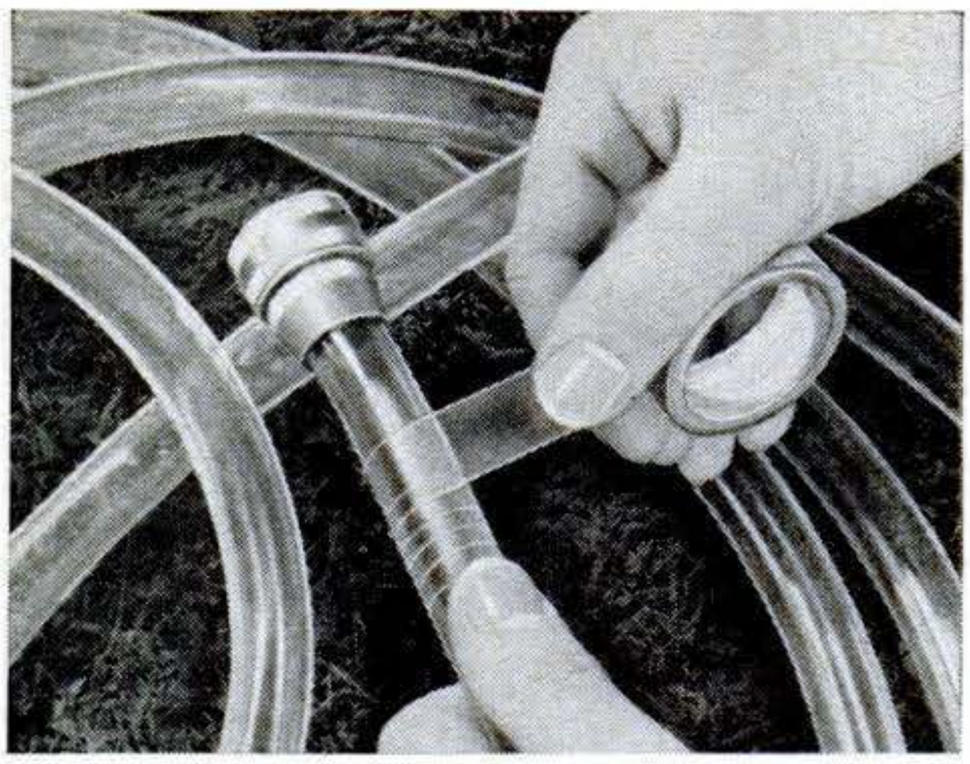

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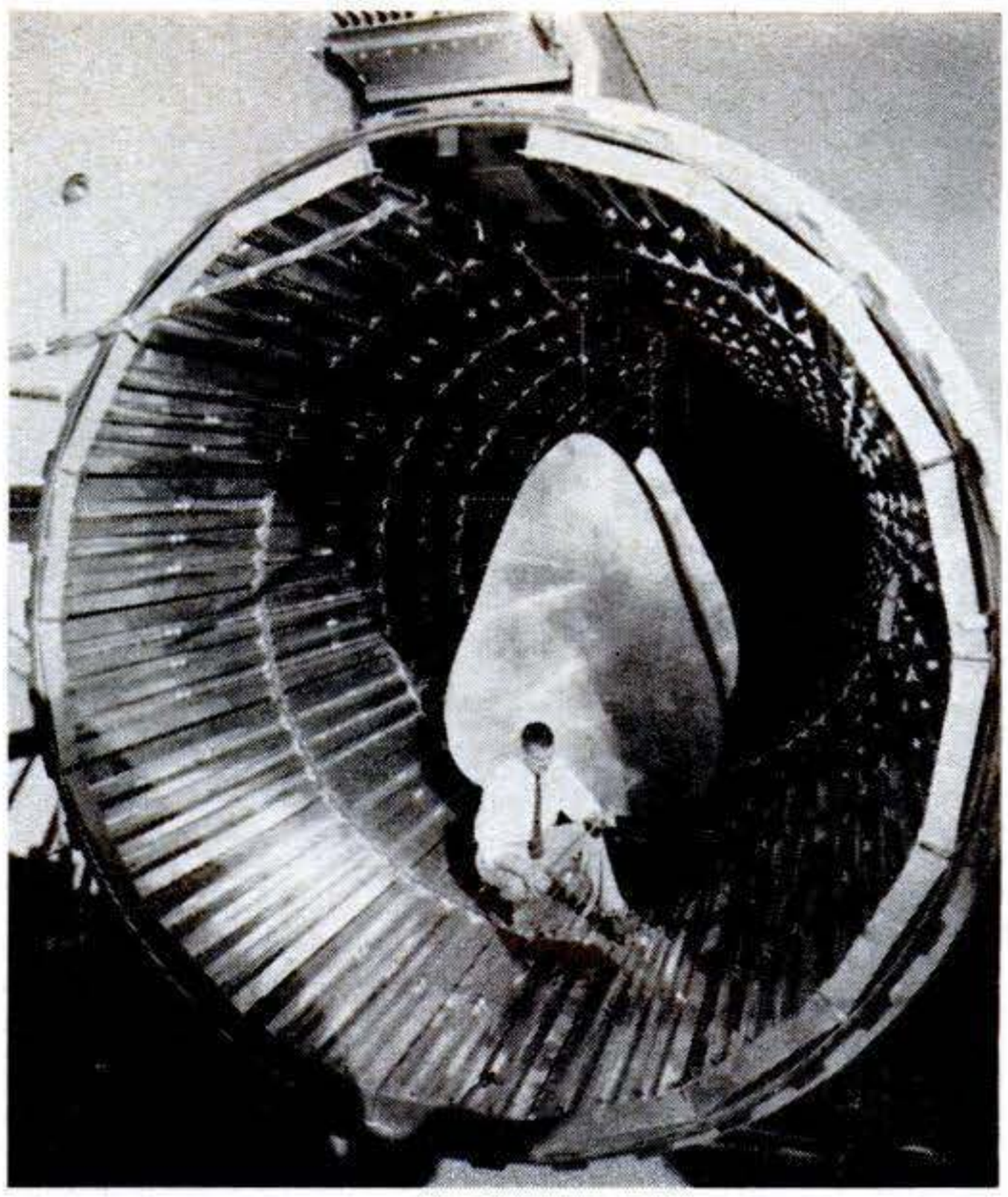

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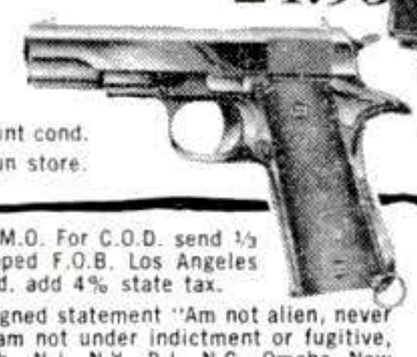

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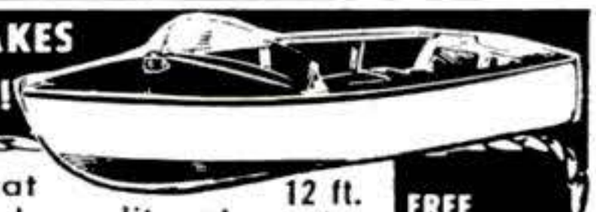

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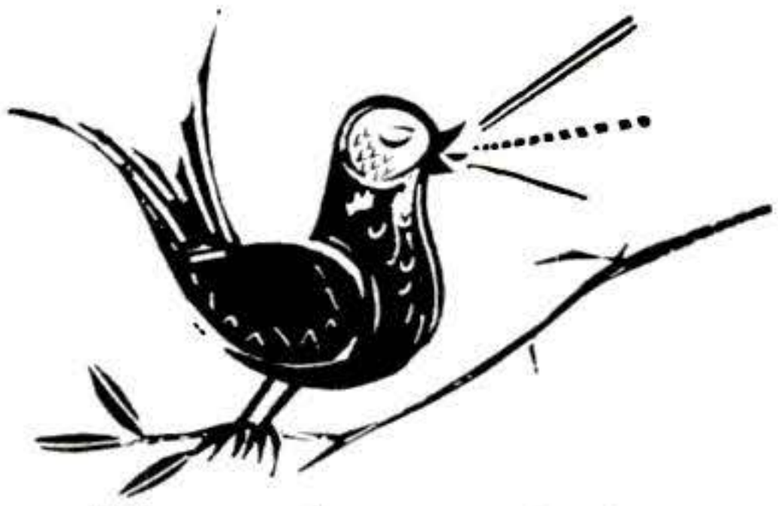

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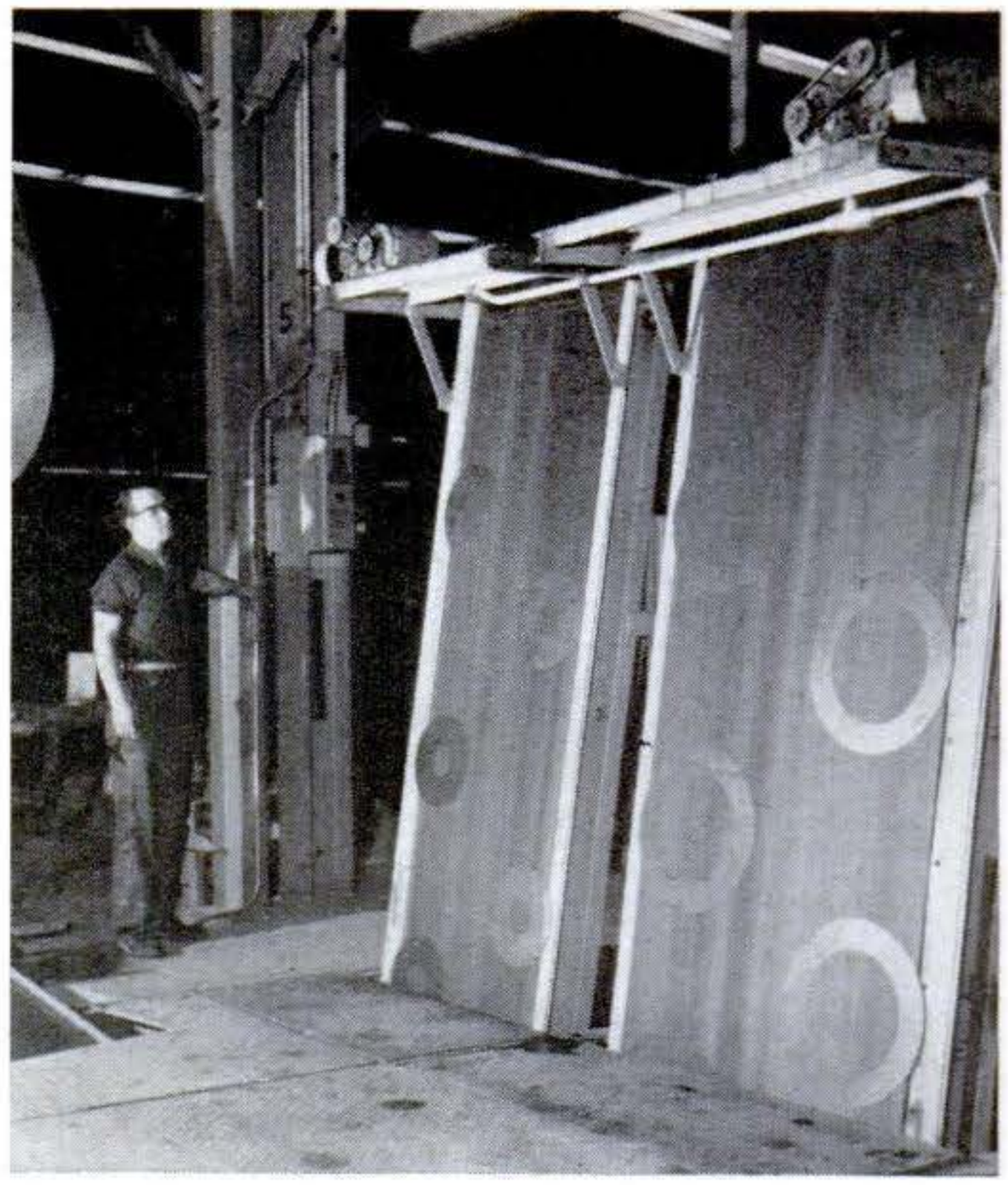

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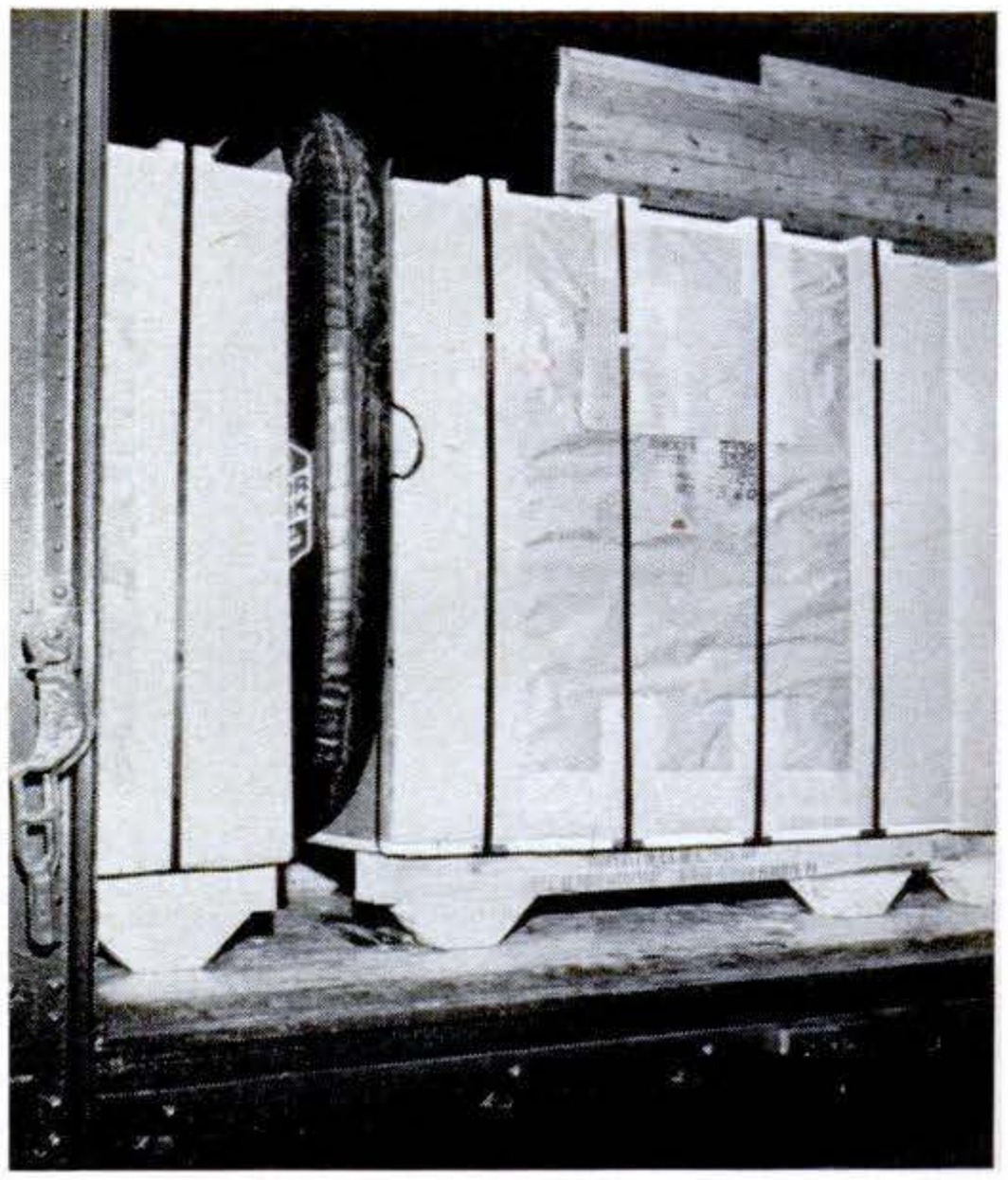

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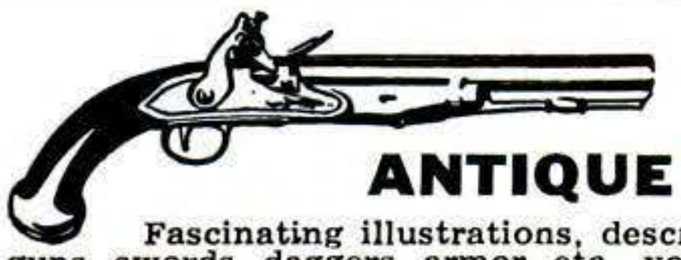

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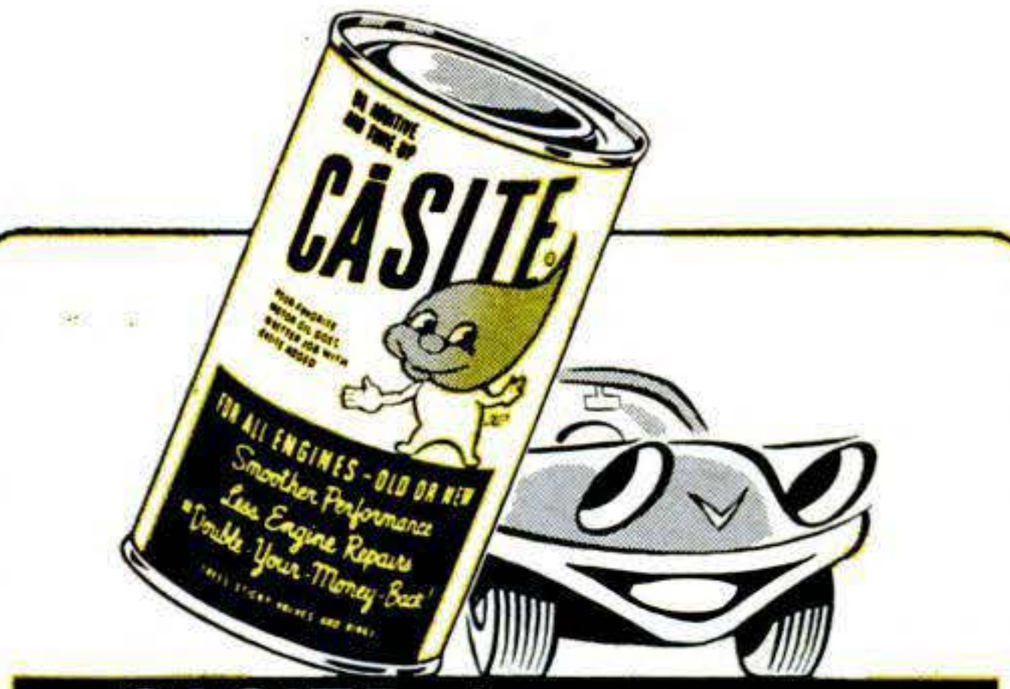

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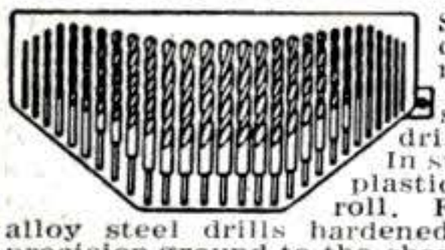

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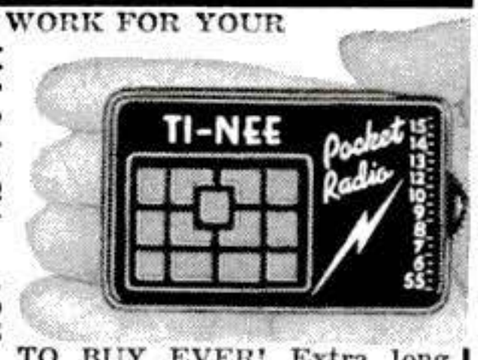

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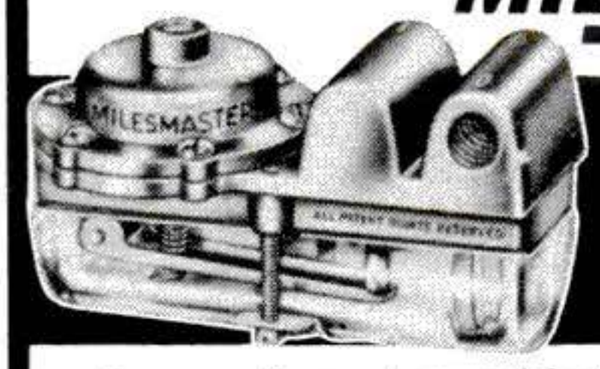

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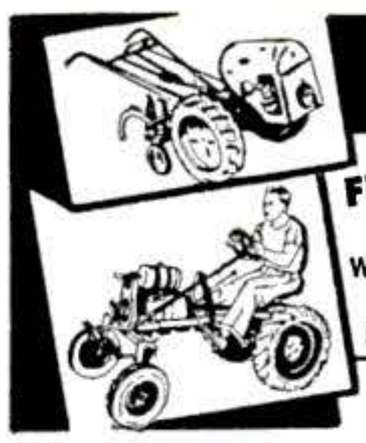

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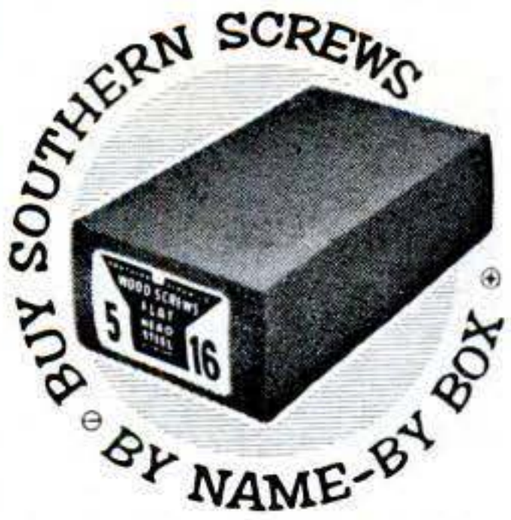

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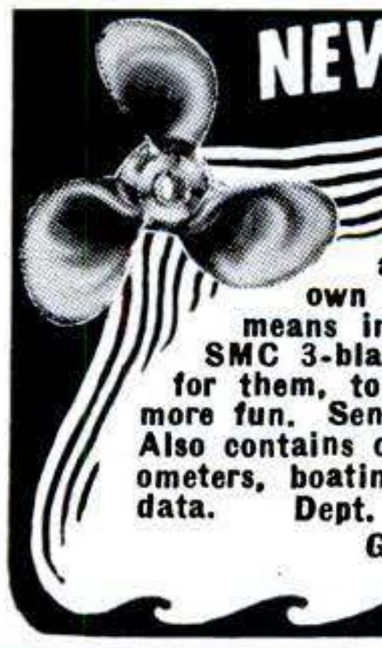

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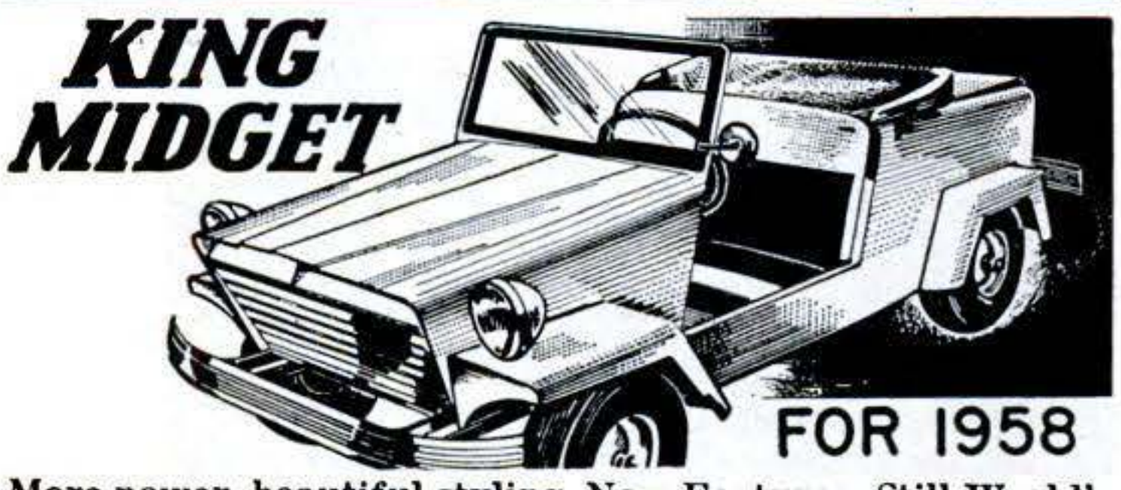

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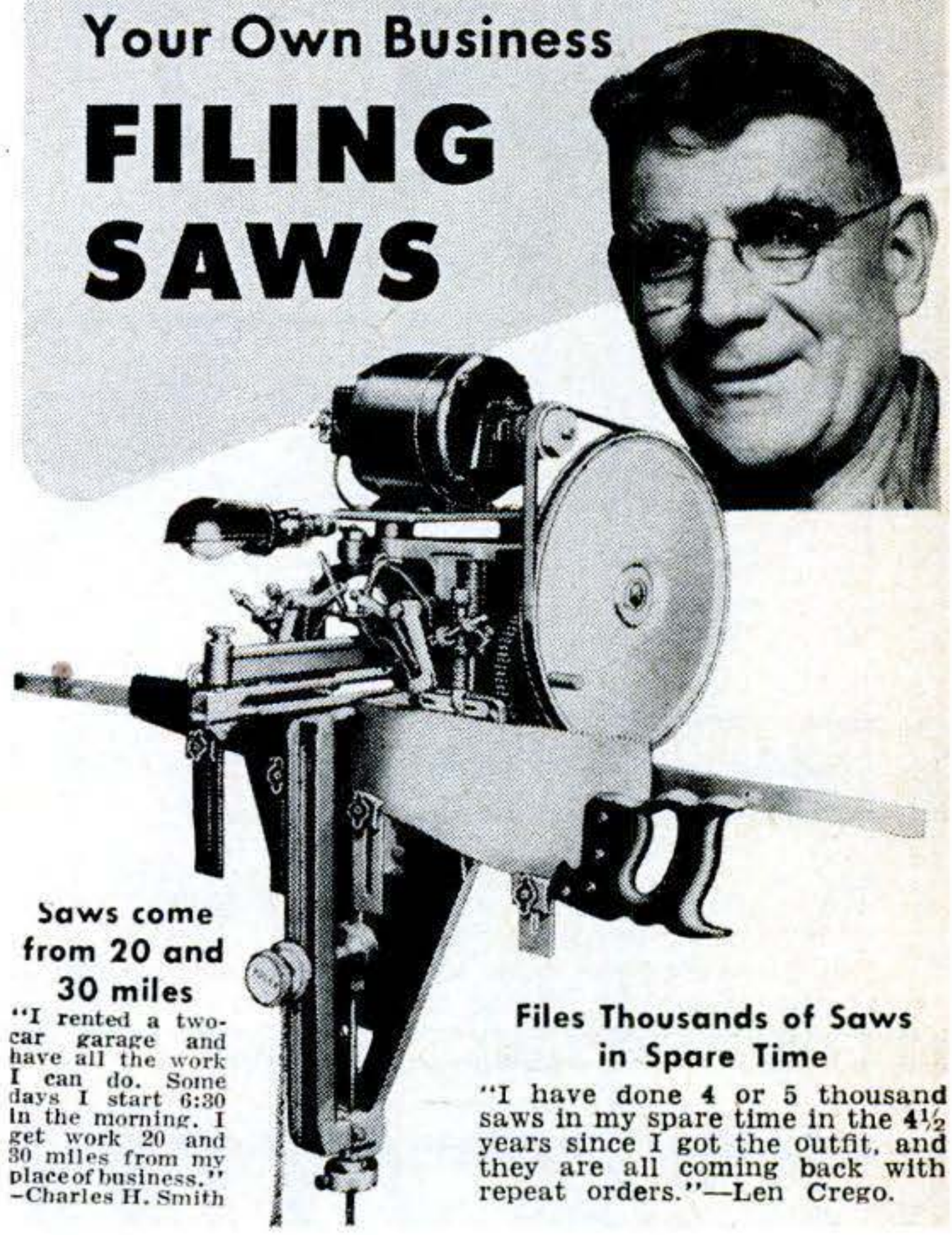

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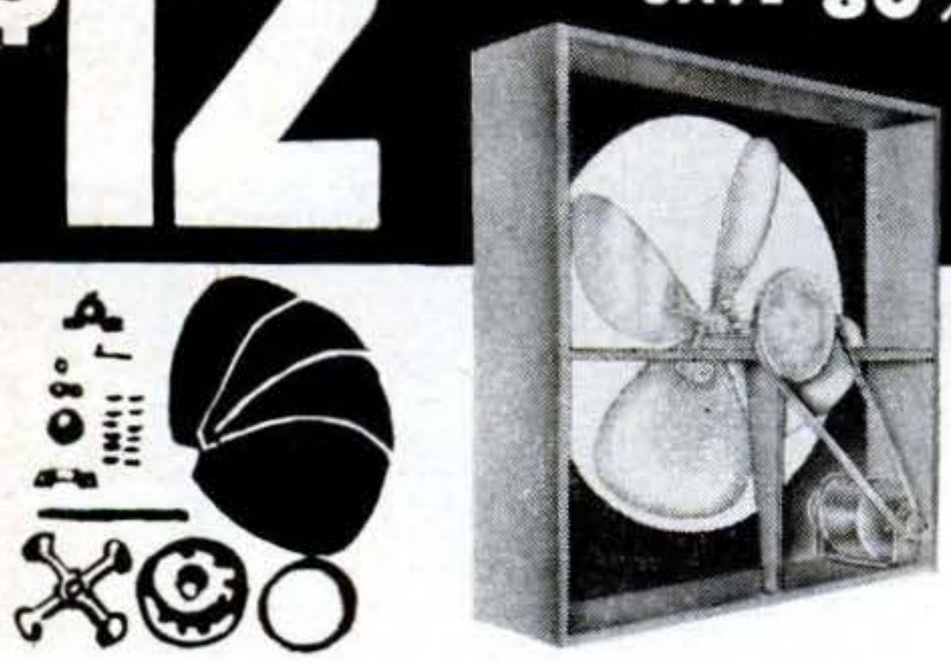

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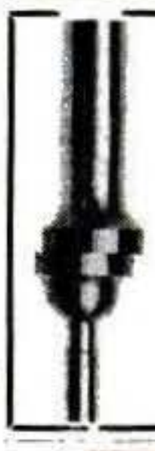

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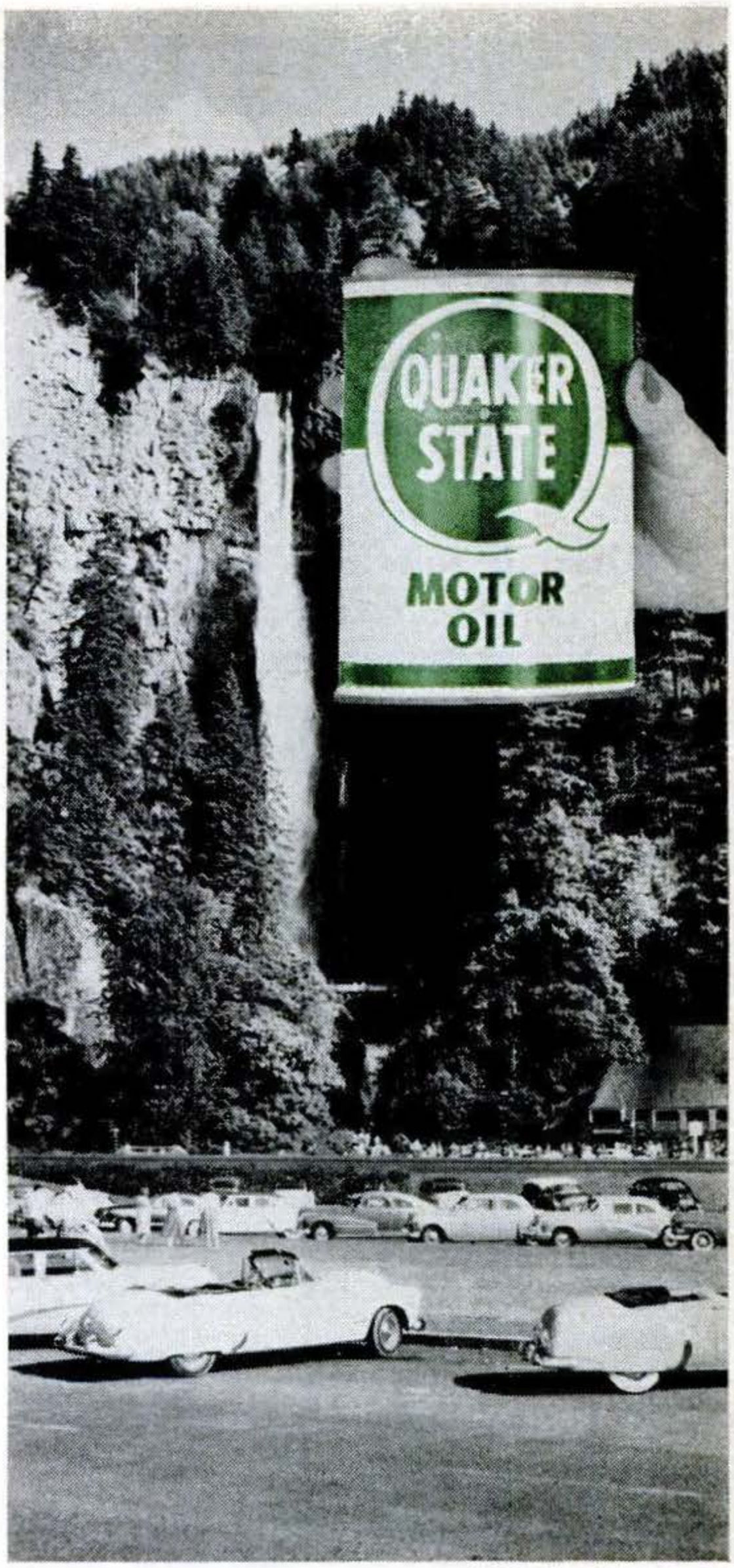

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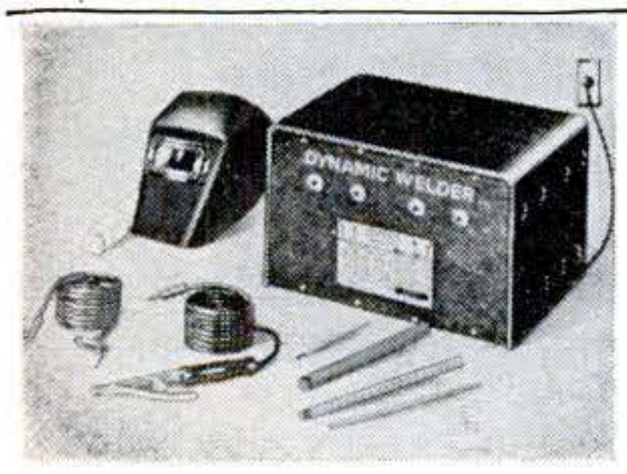

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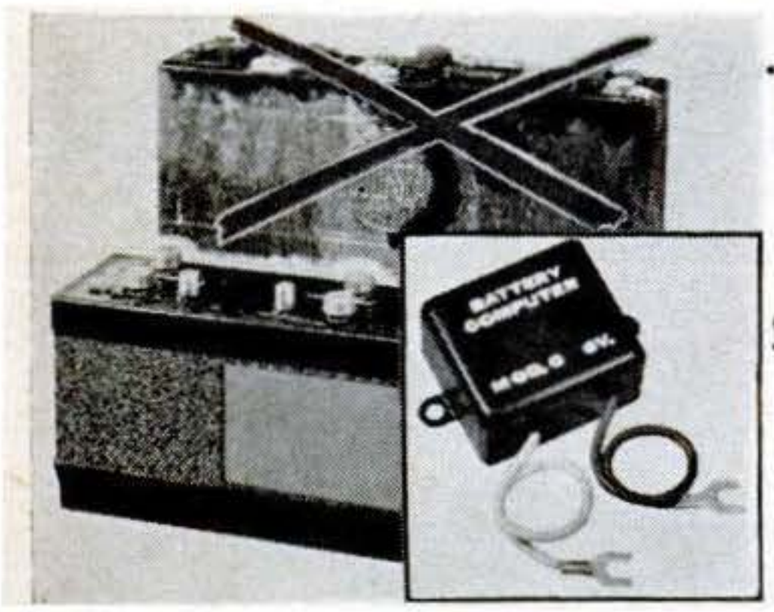

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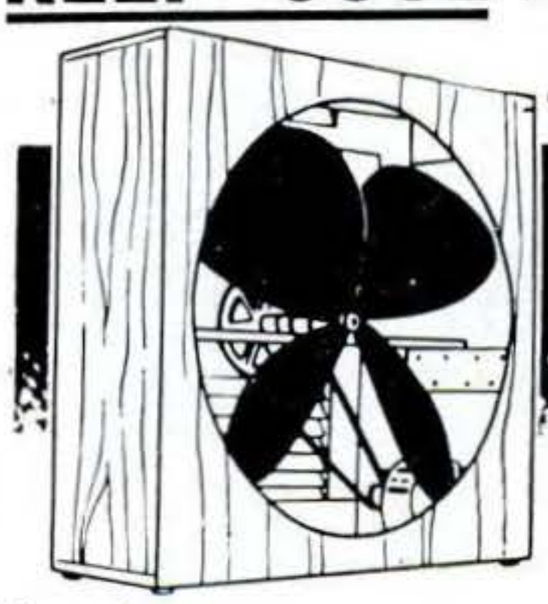

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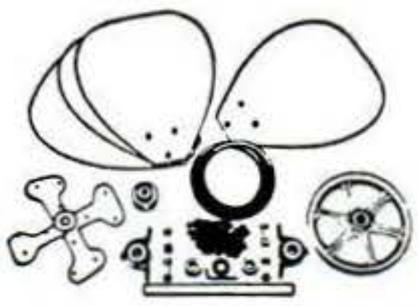

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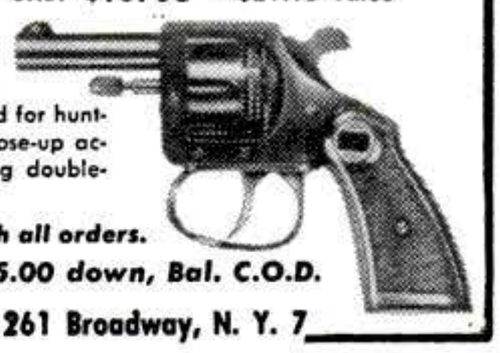

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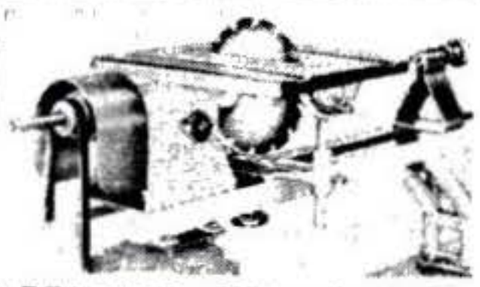

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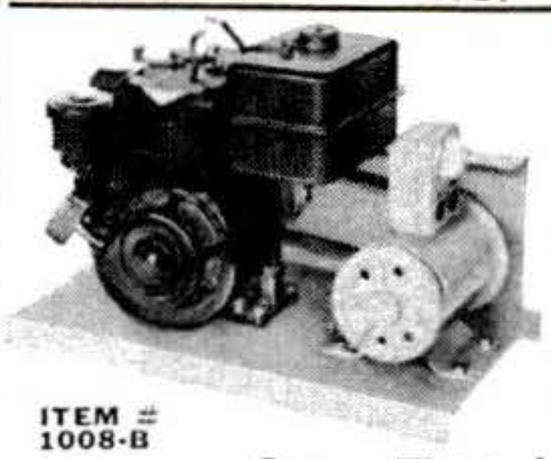

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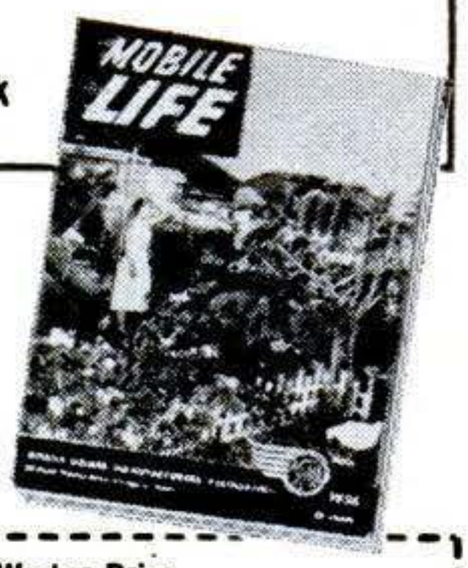

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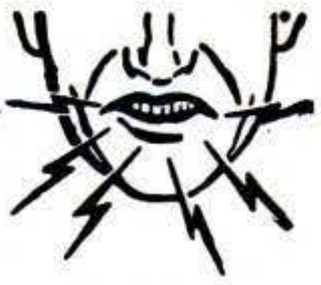

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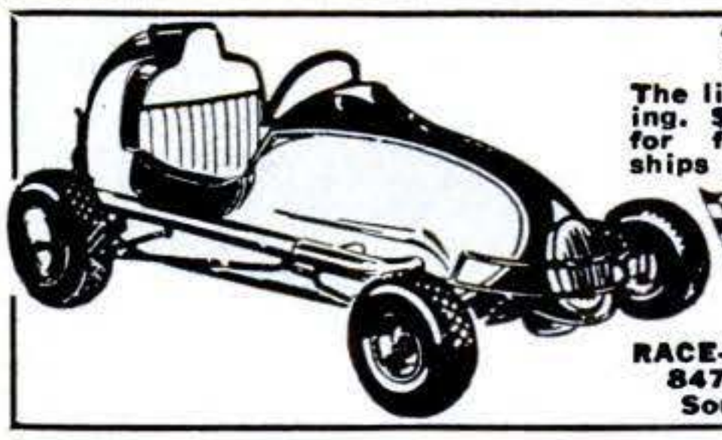

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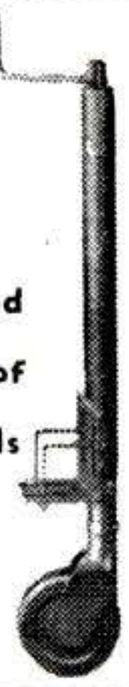

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[Continued from page 77]

information. His visual and photographic observations would be of great interest. I think, however, that most responsible scientists would feel that we could collect moon data by cheaper methods.

What then about the military value of space travel?

Ballistic missiles which will hit accurately any point of the earth from bases in the United States *are* very important military weapons, and nothing should impede our efforts to develop them.

The rocket techniques which will carry sizable warheads on trajectories of 5,000 miles on earth are also automatically adequate, with moderate change, to launch earth satellites of a few hundred pounds into orbits around the earth—and even out to the moon and beyond.

What military value will satellites have?

- They will make fine reconnaissance vehicles. With suitable optical and telemetering equipment they will provide interesting pictures of the earth's surface.
- They will be good for weather observations.

That, as far as I can see, is about the end of the military value of earth satellites. As weapon-delivery systems they are not very interesting. You can't drop a bomb from a satellite; it just won't drop. To project a bomb to earth is about as difficult as getting our human being back to earth. Besides, the ballistic missiles we already have are quite adequate weapon carriers—a lot more accurate, cheaper, more instantly available for use than any satellite could be.

What about a military base on the moon? There have been some extraordinary statements made on this question in recent months. Here is a typical one: "A base on the moon with elaborate equipment and highly trained men [what are they breathing?] would be an observation post surpassing anything military strategists have dreamed of."

I am not familiar with military strategists' dreams—but I know that from the moon only one side of the earth faces you at a time, for a good part of each month that face will be in total darkness, and much of it will probably be covered by clouds. And anyone who thinks he can see any man-made object from 240,000 miles away is optimistic.

The quote goes on: "It [the base on the moon] could launch weapons of great destruction [the very same weapons we've got here on earth now, I bet you] with terrible accuracy [terrible is right] on any target on earth. It could also be done without fear of retaliation. [Retaliation against what? Nobody on the moon could stop the enemy from wiping out New York, Washington and Los Angeles.] For us, reaching the moon first is a defense necessity."

Next Month: 125 years ago, thousands believed that there was life on the moon. How come? Read: "The Amazing Moon Hoax"—in July PS.

Some generals who ought to know better have said almost the same thing. It is my opinion that this is nonsense for many reasons. I will mention only three.

- Why transport a hydrogen warhead, together with all men and equipment, 240,000 miles to the moon, just to shoot it 240,000 miles back to earth when the target is only 5,000 miles away?
- If you did launch a bomb from the moon, the warhead would take five days to reach the earth. The war might be over by then. An ICBM can reach any target on earth in 20 minutes.
- If we have rockets good enough to land men and equipment on the moon, the enemy will surely have ones good enough to put a hydrogen bomb (a much smaller payload) at the same spot. Either people will land on the moon for peaceful purposes by mutual agreement—or else we will surely launch the nuclear war here on earth that we are trying to avoid.

I'll willingly fight a war to keep the Communists off our shores—but I am not interested in getting blown up to decide who shall have a base on the moon.

There, as I see it, is the challenge of the space age. Can we use the great new technologies of space travel for peaceful and scientific purposes—or are we going to be led into wild programs of Buck Rogers stunts and insane pseudo-military expeditions? The decision is going to be made soon—and it is high time that the best people in America do some good hard thinking about it. END

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NOW! A Portable Radio That *WORKS FOREVER* Without Batteries, Without Tubes and *NEVER WEARS OUT!*

Yes, it cost less than a tankful of gasoline, stands smaller than a pack of cigarettes!

At last it's here! One of the most incredible inventions of our century. For the first time ever, a lifetime pocket-size portable radio that uses no batteries, no tubes, no transistors . . . in other words, A MIRACLE-RADIO THAT NEVER WEARS OUT—AND PLAYS FOREVER! The secret is a built-in life-time power-plant; the same type now being used by the Army and Navy in their radar and sonar equipment.

Perfect Reception No Interference Super-Distance Range!

Just think! Here at last is a lifetime portable that you can actually tuck into the pocket of a man's shirt like a pack of cigarettes . . . or in a woman's purse just like a compact. Imagine! A super-powerful portable that you can slip into your pocket and take to work . . . on trains . . . on planes . . . on boats . . . in stores . . . to ballparks . . . on vacations and picnics . . . why even on fishing or camping trips! Yes, now you can listen to the news, sports, music or weather by simply reaching into your pocket and flipping a switch. And remember—there are no batteries, no tubes—nothing to ever break down, wear out or burn out . . . nothing to ever replace or repair because it LASTS FOREVER!

How This Amazing Pocket Radio Works—The Secret is Air!

Recently while working on a military problem, scientists developed a new type of self-powered rectifier called a GERMANIUM-DIODE . . . the same miracle invention now being used on all radar and sonar equipment. This new invention actually generates its own power by drawing electric waves RIGHT OUT OF THE AIR! And it is this amazing electronic discovery that finally makes possible a lifetime pocket radio that uses no batteries, no tubes, no transistors.

2 Extra Bonus Features

To make sure that your LIFETIME PORTABLE gives you the finest reception possible — electronic engineers have added 2 bonus features. First, the super-distance ferrite loop antenna that gives your LIFETIME pocket radio extra clarity. Next, the direct-circuit personal earphone speaker that enables you to listen to your favorite program in complete privacy . . . even in bed, without disturbing others. Yes, when you receive your LIFETIME POCKET RADIO you are getting a true precision portable radio that is guaranteed to give you the finest reception possible . . . guaranteed to LAST FOREVER!

LIFETIME GUARANTEE
Guarantees your LIFETIME POCKET PORTABLE not for just a year . . . not even for just 5 years . . . but FOREVER! . . . OR WE WILL SEND YOU A BRAND NEW RADIO or refund your money completely.

½ ACTUAL SIZE ▲ You are now looking at the first radio of its kind in history! A POCKET-SIZE PORTABLE that's as small as a pack of cigarettes . . . so powerful it picks up broadcasts from as far as 10 cities away—so completely different it never uses batteries or tubes—Yes, a radio that never wears out, never needs repair, actually lasts FOREVER . . . and best of all costs a mere $4.95 complete and ready to operate!

Imagine! No batteries to wear out — no tubes to replace — nothing to plug in. The result: Not only the smallest portable in the world—but the LOWEST PRICED ONE TOO!

TRY IT FREE FOR 10 DAYS!

Yes, try the LIFETIME PORTABLE for 10 days at our expense! And if after hearing its tone and clarity . . . you don't agree this is truly the most sensational portable radio you've ever seen in this country before, then simply return it and it has not cost you a cent. Yet have tried it entirely at our expense!

Springtime Rush For Portables is Exhausting Our Supply. This FREE-TRIAL Offer May End Any Day — SO ACT NOW!

Now, the price of your LIFETIME POCKET RADIO on this special offer is an unbelievably low $4.95 . . . probably the lowest price a portable has ever been sold for. And remember — with the LIFETIME PORTABLE there are no repairs, no tubes to replace, no batteries to ever buy; so it not only pays for itself but in the long run saves you money, too. However, at this low price, the enormous surge of orders is dwindling our supplies rapidly. So to take advantage of this FREE-TRIAL OPPORTUNITY, send the no-risk coupon today.

A PERFECT BEDTIME COMPANION TOO — Yes, thanks to the personal earphone attachment included with your LIFETIME PORTABLE . . . you can even enjoy your radio in bed without disturbing others. This attachment alone would cost you several dollars with any other portable but with your LIFETIME PORTABLE it costs you not a penny extra if you take advantage of this FREE-TRIAL offer now!

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Send me my LIFETIME POCKET PORTABLE (complete with personal earphone attachment and built-in super distance antenna). If I don't agree that this is by far the greatest value offered on a portable radio . . . If I don't receive perfect, clear reception at all times . . . if my lifetime radio doesn't play FOREVER . . . then you will refund my money immediately.

CHECK OFFER DESIRED

☐ I enclose $4.95 on money back guarantee. (I save 56c in handling and C.O.D. charges.)

☐ SAVE MORE! I enclose $8.95 for two radios (one for myself, one for a friend) and I save $1.00.

NAME _____

ADDRESS _____

CITY _____ STATE _____

☐ C.O.D. orders accepted. Send my Lifetime Pocket-Portable C.O.D. I will pay postman $4.95 plus C.O.D. postage. Same money-back guarantee of course.

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Special Bonus!

Save $66.67 on This Lathe

Up to $66.67 of Accessories *FREE* With South Bend 10-K Lathe

BUY THIS	*GET THIS FREE*
Model A 10-K Lathe	$66.67 Accessory Assortment A
Toolroom 10-K Lathe	$66.67 Accessory Assortment A
Model B 10-K Lathe	$58.20 Accessory Assortment B

Model C 10-K Lathes come with a $50.55 Assortment.

Here's your chance to get a fine South Bend 10″ Precision Lathe *plus* a big assortment of essential lathe accessories *without extra charge.* Choose from 68 models and sizes for all your production, toolroom, maintenance and experimental needs. This is the first time such an offer has been made—but it ends August 31st—so act quickly. Mail the coupon now.

Model A 10-K Lathe illustrated. Model B Lathes have independent change gears instead of gear box. Model C Lathes have independent change gears and plain apron.

Accessory Assortment A

10 in 1 Tool Holder	$14.70
Face Plate Chuck	19.50
Set 21 Drills, 1/16″ to 3/8″	11.97
Thread Indicator Dial	10.95
3 Dogs—1/2″, 1″, 1 1/2″	4.60
Knock-out Bar	1.65
Cutter Bits	3.30
Total	**$66.67**

Accessory Assortment B

10 in 1 Tool Holder	$14.70
Face Plate Chuck	19.50
Thread Indicator Dial	10.95
Knock-out Bar	1.65
Cutter Bits	3.30
Center Drill Holder	3.50
3 Dogs—1/2″, 1″, 1 1/2″	4.60
Total	**$58.20**

No substitutions, returns or exchanges.

10-K LATHES

12-SPEED HORIZONTAL MOTOR DRIVE

Catalog Number	Model	Bed Length	Price
CL653Z	C	3 1/2′	$412
CL653A	C	4′	436
CL653R	C	4 1/2′	470
CL667Z	B	3 1/2′	487
CL667A	B	4′	511
CL667R	B	4 1/2′	545
CL670Z	A	3 1/2′	570
CL670A	A	4′	594
CL670R	A	4 1/2′	628
CL8670Z	Toolroom	3 1/2′	800
CL8670A	Toolroom	4′	824

Also available with 16-speed V-belt drive, and with Metal Column Base or Self-Contained Motor Drive. Prices f.o.b. factory, less electrical equipment.

South Bend Lathe, South Bend 22, Indiana

Please send literature on 10-K Lathe Special Offer—also name of nearest distributor.

☐ Send complete Time Payment information.

Name _____

Street _____

City, Zone _____ State _____

(Offer limited to continental U. S. and expires August 31, 1958)

SOUTH BEND LATHE

SOUTH BEND 22, INDIANA

Builders of Lathes, Milling Machines, Shapers, Drill Presses, Pedestal Grinders

SOUTH BEND PAYMENT PLAN

Up to 24 months to pay.

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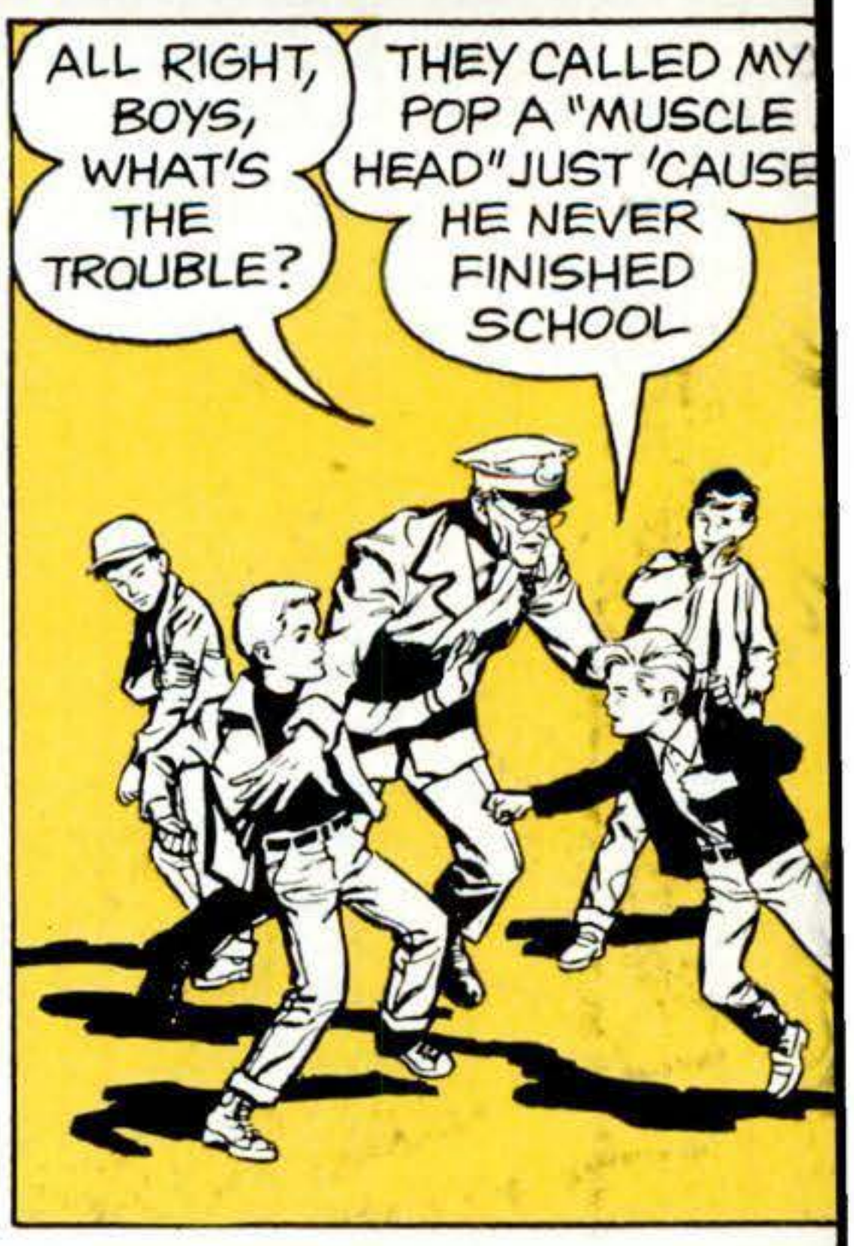
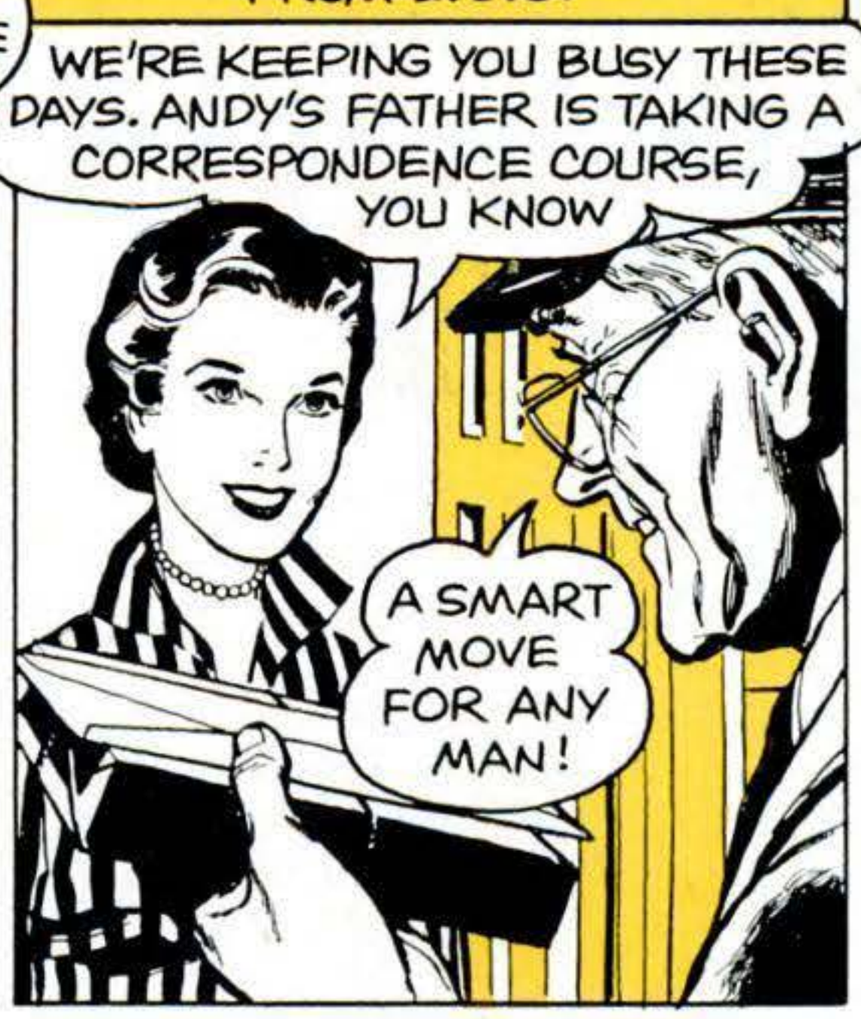
THE MAILMAN

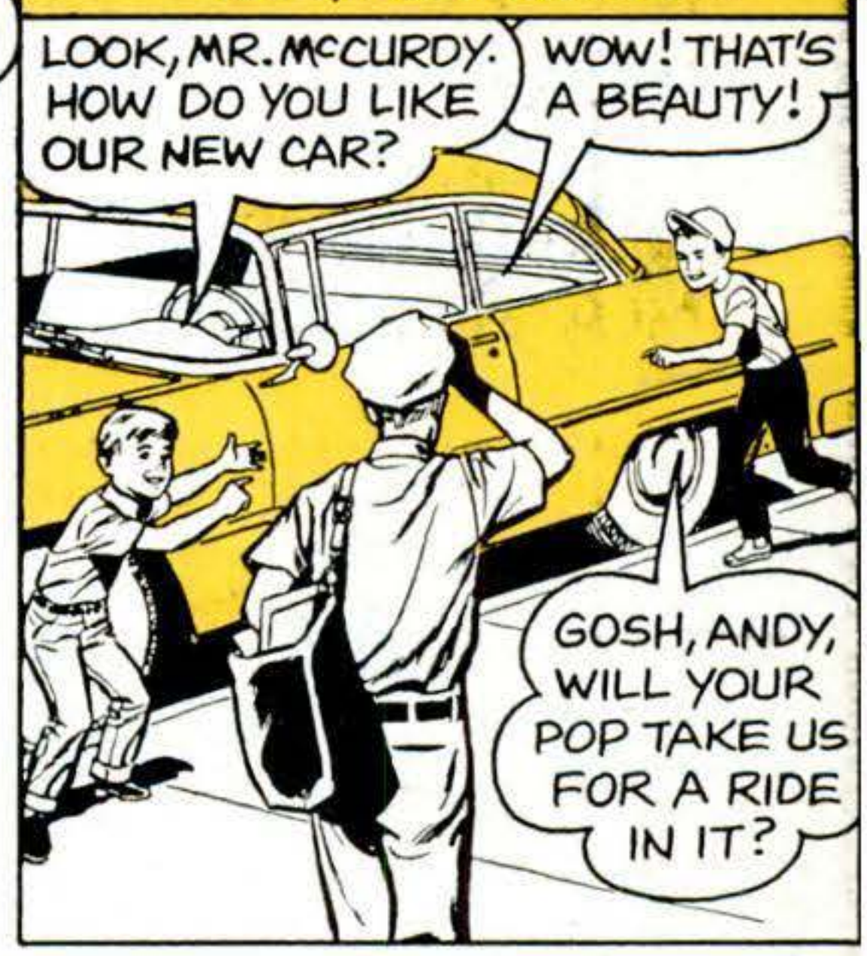
I REMEMBER THE MORNING I FOUND ANDY SHOLL TRYING TO TAKE ON THE WHOLE NEIGHBORHOOD...



SURE ENOUGH, WITHIN A FEW WEEKS I BEGAN TO DELIVER MORE LETTERS AND PACKAGES FROM I.C.S.

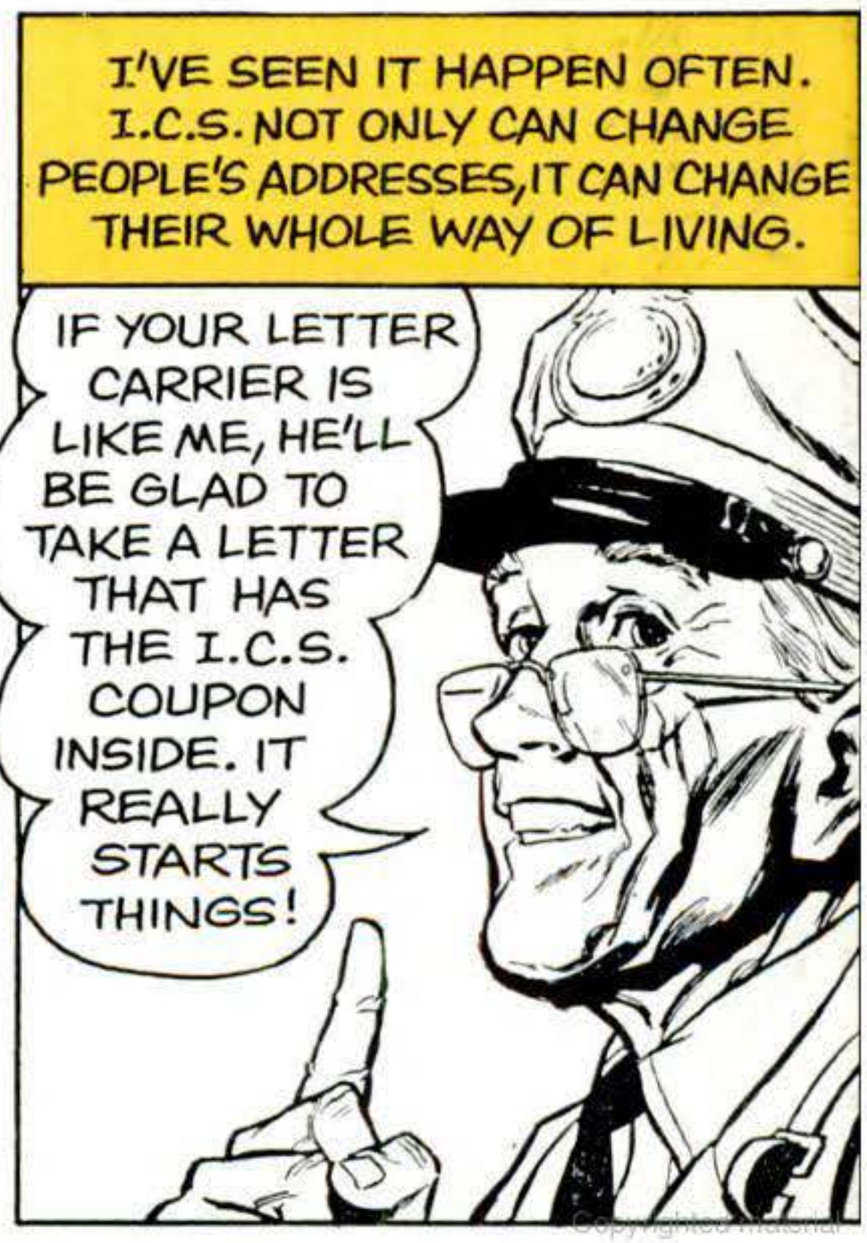


IT WASN'T LONG BEFORE I BEGAN TO NOTICE CHANGES IN THE SHOLL'S HOME. LITTLE THINGS. NEW CURTAINS. FLOWER BOXES. FRESH PAINT. AND THEN, ONE MORNING...



A FEW WEEKS LATER, MRS. SHOLL MET ME AS I CAME UP THE STEPS...

I'VE SEEN IT HAPPEN OFTEN. I.C.S. NOT ONLY CAN CHANGE PEOPLE'S ADDRESSES, IT CAN CHANGE THEIR WHOLE WAY OF LIVING.



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LIKE A CIGARETTE SHOULD!

"Bright, clean flavor...pure, snow-white filter...that's WINSTON"

SAYS *Bob Cummings* "I go right along with the majority," says the star of The Bob Cummings Show on NBC. "It's America's favorite filter cigarette—and mine!" To a rich, bright blend, Winston adds its own specially designed, pure white filter. The result is an unusually clean, fresh taste — the Winston taste! You'll like it, too!

R. J. REYNOLDS TOBACCO CO., WINSTON-SALEM, N. C.

Smoke WINSTON America's best-selling, best-tasting filter cigarette!

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